THE IRON TRADE REVIEW

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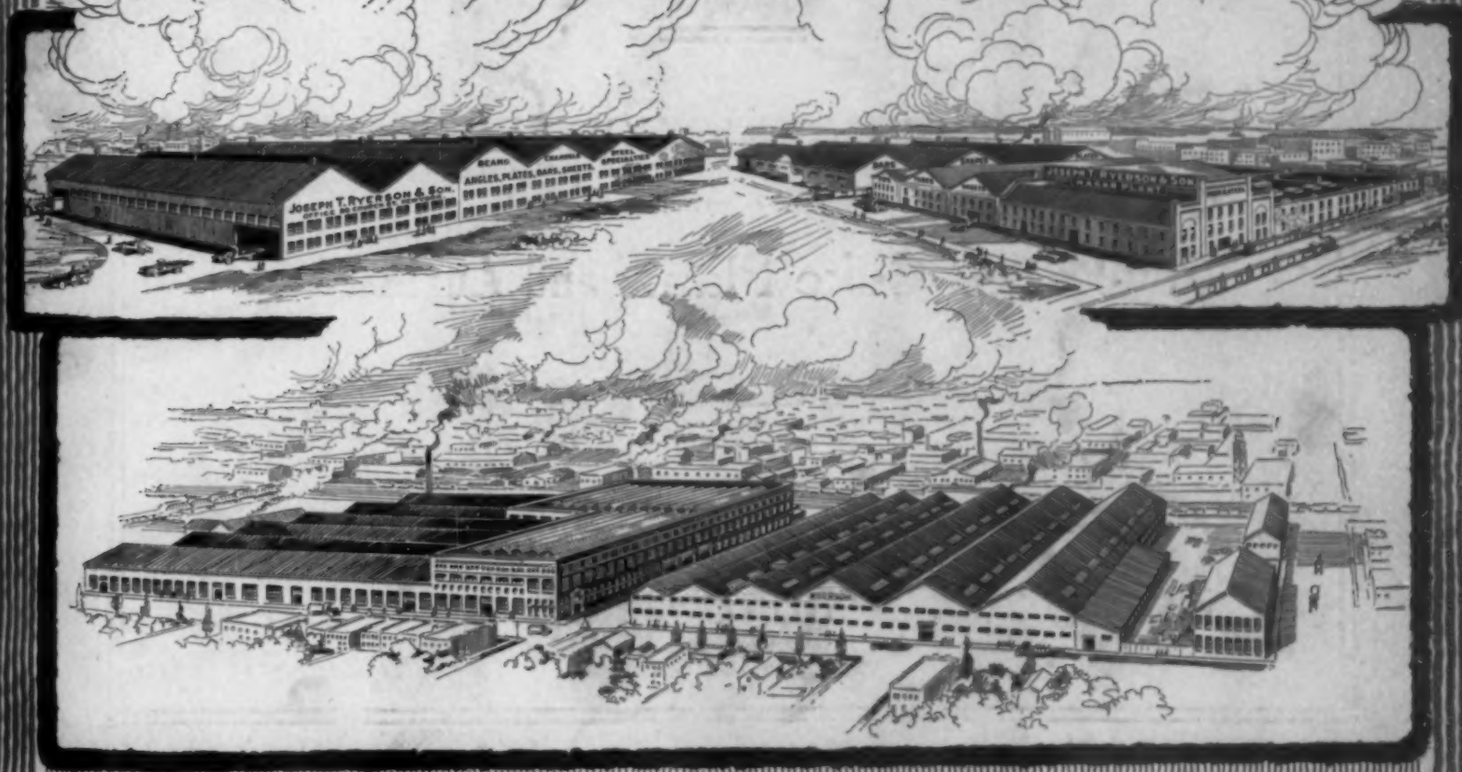

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THE IRON TRADE REVIEW

Vol. LIX Cleveland, November 9, 1916 *No. 19*

Advances Do Not Stop Buying

Highest Prices in Years on Pig Iron and Some Finished Products—Iron Ore Buying May Be Started at Any Time

RAPID advances in prices of pig iron and announcements of higher quotations on various kinds of finished products, with the expectation that the upward trend will continue, feature the market. Buying has not, however, been checked and sales agents of finished products are exercising all the ingenuity they can command to keep their customers satisfied and to prevent plants from being compelled to cease operations on account of inability to obtain deliveries of materials. The election has had little, if any, effect to date, as it has been generally recognized that activity in the markets will continue throughout the European war, regardless of the decision of the people concerning the presidency.

Pig iron production for October made a new record, the tonnage being 3,509,180, a gain of 301,139 over September. The average daily production was 113,199 tons, a gain of 6,264 tons over September.

Railroads

Heavy buying of cars by the railroads continues and orders for 12,000 have been placed during the past week. Although it has been understood that some sales of rails for delivery in 1918 have been made at 1917 prices, it is definitely known that this policy is not being continued and it is expected that there will be an advance in prices for 1918 shipment.

Shapes and Plates

An additional order for 10,000 tons of beams for export to France has been placed with a Pennsylvania mill. The urgency of the requirements of some foreign buyers is shown by the fact that purchases are being made from warehouses at full store prices. The demand for plates continues to be extremely heavy and one eastern mill has advanced its quotation $15 per ton, or to a base price of 4.75c. Boiler steel is now being sold at $208 per ton. Large tonnages have been placed by ship builders, including 8,000 tons by one company for delivery in the first half of 1918, and another tonnage for the last half of 1918. One eastern mill booked 25,000 tons within the past few days. A new Seattle yard has ordered from 15,000 to 20,000 tons for six boats.

Iron Ore

The shipment of Lake Superior iron ore for October, 9,116,196 tons, again made a record. The movement to date is 57,932,846 tons, a much greater tonnage than ever before was moved in a complete season, and an increase of 16,116,407 tons over 1915. While some ore sellers are taking a decided stand against selling ore until ore carrying rates for next year have been established, it will not be at all surprising if the ore buying movement is started within a few days at an advance of from $1 to $1.25 a ton over this year's prices.

Sheets and Tin Plate

The American Sheet & Tin Plate Co. has withdrawn its quotations of $5.75 base box for tin plate, as it has sold all that it can manufacture up to July 1, next year. Independents are selling at $6 and higher. Sheets show considerable irregularity, but some mills are quoting very high prices.

Pig Iron

Prices of pig iron continue to advance. In the south, quotations were moved up $3 within a week, and throughout the central west and east quotations are being advanced rapidly. Basic in the valley is held at $24, and a round tonnage has been sold at $23.50. A Phoenixville, Pa., company purchased 22,000 tons at $25, delivered, and this grade of iron is being held in eastern Pennsylvania at from $25 to $25.50, delivered. In Chicago territory, sales of No. 2 foundry amounting to 8,000 tons have been made at $25, furnace, and higher quotations are expected.

Wire

All wire products have been marked up $3 per ton, making the highest price which has prevailed since 1900, and showing an advance of $20 per ton within a year. Higher quotations on bolts, nuts and rivets are expected.

THE OPEN HEARTH

The Vote of the People

THE result of the presidential election is still in doubt as *The Iron Trade Review* goes to press. While the strong vote obtained by Wilson in western states indicates that a vast number of voters approved his foreign policy and were impressed by the claim of his party that he had kept the country out of war, the result in many of the states shows that the voters believed it imperative to have in the white house at the close of the great war, a man concerning whose faith in a protective tariff there could be no doubt.

A new tariff bill should be passed that will furnish ample protection, but at the same time provide for fair dealing with all nations of the earth which are willing to deal with the United States on a just basis.

Second only to the importance of the election as related to the tariff, is its significance concerning labor. The appeal of the labor agitators has failed, at least in many parts of the country, and the next congress will not be dominated as the present one has been by the brotherhoods with their bludgeon or by Gompers and his bulldozing cohorts.

Many problems before the President will be exceedingly grave and he deserves, and we believe will receive the heartiest support of all patriotic citizens, whether he be Hughes or Wilson. Surely never since the civil war has it been so important for people to bury their partisanship and do their utmost to maintain the honor and the prestige of their common country.

The campaign just ended has been vigorously fought, but there has been no more bitterness than in many other presidential contests. Now that the popular vote has been recorded, the American people, with characteristic good nature, will accept the result cheerfully.

A Fair, Frank Proposition

THE extraordinary conditions now prevailing in the labor and material markets are responsible for making unusually interesting the bids recently submitted to the government on four battleships and 20 torpedo boats. All of the bids on battleships were conditional, as were also a number of those on destroyers. The bids were also of unusual interest on account of the recognition of the federal trade commission as an important factor of much importance in carrying out the contracts.

Proposal A of the Fore River Ship Building Corporation is an example of the unique provisions of a number of the bids. It is based on the assumption by the government of the risk of increased costs of labor and material, and under it the company proposes to construct one of the battleships of class A for $10,360,000, or two for $10,060,000 each. This amount is based on current rates for labor and material and the company states that upon request it will submit the information which it has in detail to the navy department and to the federal trade commission. If the current unit costs of labor and material remain unchanged, there will be no change in the price of the battleships, but if these costs are exceeded, the contract price for the vessels are to be increased accordingly. If, on the other hand, the costs decrease, it is proposed that the government shall have the benefit of the reduction and that the contract price of the vessel shall be reduced to a corresponding extent. The federal trade commission is explicitly recognized as the department of the government organized to deal with all questions pertaining to commercial operations and costs and it is proposed that the commission shall adjudicate the increases or decreases and determine the increased or decreased cost of material and labor annually. If the government should so desire, it will be informed in advance, before signing the contract, precisely how the company arrives at its estimated costs and as to the amount of profit which it expects to earn. "The conditions today in the ship-building business are unique," says the company. "In the entire industrial history of this country, it has never before been so difficult to forecast the probable cost of labor and material over a period of years." The company states that on account of the unprecedented activity in all lines of business, it has not been feasible to cover by option or provisional contract more than 50 per cent of the total material required and the remainder must be purchased at different times during the succeeding four years. Conditions are even more uncertain in the labor market.

Proposal B contemplates assumption by the company of the increased costs of labor and material, and under these conditions the company proposes to construct two of the battleships of class A for $10,875,000 each, or $815,000 more than it will charge if the government assumes the risk as to material and labor. The proposals strike us as being eminently fair. The company, recognizing the emergency confronting the United States, has for months refused to contract with many others and has reserved a substantial capacity for such work as the navy department might desire to allot to it, and it surely is fair for the government to be willing to adjust the contract price as proposed. The perfect frankness of the proposition is highly commendable and indicates a method of doing business which has seldom prevailed in the past.

An Analysis of the Ore Situation

BY R. V. SAWHILL

Fear of a Shortage This Winter is Lessened

HAS enough Lake Superior iron ore been brought down this year to permit the blast furnaces to run at capacity throughout the winter? Or, has the demand for ore so depleted the supplies at the mines and in furnace yards that even though no shortage develops this winter, there may be a shortage in the winter of 1917-18?

The keenest students of the Lake Superior ore market will answer "yes" to the question concerning this winter's supplies, but they will hedge on a positive statement regarding the situation in the winter of 1917-18. The reason for the "yes" is also the reason for the hedging, that is, the surprising demonstration of unsuspected capacity shown by the lake fleet this year makes the ore interests more optimistic now than they were eight months ago when conditions were really more favorable.

The Fortunate Discovery of 10,000,000 Tons

BEFORE the present season of navigation opened, there was an almost universal belief that a shortage of ore would appear this winter. Every ore shipper and vessel owner, and some of the blast furnace interests, had given considerable study to the situation. These studies indicated that ore consumption would approximate 60,000,000 tons, which has proved true. The studies indicated an ore movement of 53,000,000 tons, the most optimistic estimate being 57,000,000 tons and the lowest 51,000,000 tons. The estimated ore movement proved to be 10,000,000 tons short of the actual. These 10,000,000 tons save the situation and transform the outlook at this time from one of anxiety to both ore and pig iron interests, to one of confidence.

The ability of the lake fleet to carry ore proved a continuous revelation. The big April movement was the first pleasant surprise and it was matched quickly by record-breaking shipments in May and June. *The Iron Trade Review* in its issue of July 20, presented an analysis of the ore situation that indicated there would be no shortage this winter and at that time most of the interests concerned were slowly and hopefully coming around to the same view.

Some refused to be convinced. In September, one periodical used the "expectation of an early winter" as a bear argument. Another observer continued to emphasize the heavy movement from docks to furnace yards as an indication of the shortage at the yards, when as a matter of fact the blast furnace interests were taking advantage of good railroad dispatch to move the ore, a far-sighted view that the present car situation justifies. Conditions were exceptionally favorable throughout the year. Dispatch at both upper and lower lake ports was excellent, the water was deeper, the weather uniformly good. Even now with slower dispatch at lower lake ports, the ships are saving time at the upper lake docks as fair weather has kept the ore from freezing.

Analysis Indicates Sufficient Ore This Winter

THE situation that may arise in the winter of 1917-18 seems to depend more upon the mining interests than the vessel men. The situation this winter is indicated by the following analysis compiled by *The Iron Trade Review*. In the six months from April 1 to Sept. 30, 1916, the country's production of pig iron, excluding ferro, spiegel and charcoal iron, was 19,202,691 tons. Charcoal iron is excluded as it is practically all made from all-rail ore. Allowing for a heavier production in the six months from Oct. 1, 1916, to March 31, 1917, as the active furnaces will operate better than during the past summer and new furnaces will be blown in, we obtain an estimated production in the fiscal year ending April 1, 1917, of 38,900,000 tons.

The pig iron produced from Lake Superior ore in the first six months of that fiscal year by the furnaces always using that ore was 15,313,200 tons. For the full year ending April 1, 1917, production will be about 31,050,000 tons. On the basis of 1.85 tons of ore to a ton of pig iron, consumption in the first six months was 28,330,000 tons and in the second six months will be 29,110,000 tons, a total of 57,440,000 tons. To this must be added 2,936,000 tons which eastern furnaces bought for this year's delivery and 1,000,000 tons for Canadian furnaces, while 1,150,000 tons must be deducted for those coke furnaces which use all-rail Lake Superior ore. This gives 60,226,000 tons as the estimated consumption of Lake Superior ore between April 1, 1916 and April 1, 1917.

To meet this demand we have 11,000,000 tons estimated to be on furnace yards April 1, 1916; 57,932,846 tons shipped from upper lake ports up to Nov. 1; 5,000,000 tons to be moved in November and December, and 4,894,000 tons on docks at lower lake ports on April 1, 1916. This gives a total supply of 78,826,846 tons against a consumption in the same 12-month period of 60,226,000 tons, or a surplus of 18,600,000 tons. This compares with a surplus on April 1, 1916, of 16,000,000 tons, and on April 1, 1915, of about 23,000,000 tons.

How April 1, 1917, Will Compare With April 1, 1916

THIS indicates that there will be more ore on hand next April, despite the tremendous pig iron production, than last April. It should be recalled, however, that more lean ore is being consumed and for that reason the standard ratio of 1.85 tons of ore to a ton of pig iron, may be somewhat low. The difference would not change the indicated surplus appreciably.

This analysis deals primarily with the situation up to April 1, 1917. Beyond that date, a number of new factors, not considered here, will have an important influence.

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products November 8, average for October, 1916, average for August, 1916, and average for November, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Nov. 8, 1916.	Aver. for Oct., 1916.	Average for Aug., 1916.	Aver. for Nov., 1915.
Bessemer pig iron, Pittsburgh..	$28.95	$24.325	$21.95	$17.45
Basic pig iron, Pittsburgh.....	24.95	20.825	18.95	16.70
No. 2 Fdy. pig iron, Pittsburgh	26.40	21.075	19.45	16.45
Northern No. 2, Fdy., Chgo....	25.00	19.15	19.00	17.12
Lake Superior Charcoal, Chgo..	25.75	20.35	19.75	17.50
Malleable, Chgo.	25.00	19.50	19.50	17.40
Southern No. 2, Birmingham...	20.00	15.13	13.75	13.13
Southern Ohio No. 2, Ironton..	23.00	19.38	18.50	16.13
Basic, eastern Pa.....	22.00	20.75	19.25	17.75
No. 2X Virginia furnace.....	20.00	18.50	18.50	15.50
No. 2X foundry, Philadelphia...	22.75	20.75	19.75	17.50
Ferro mang., Balti.....	164.00	162.00	175.00	100.00
Bessemer billets, Pbgh.....	50.00	45.75	43.60	27.75
Bess. sheet bars, Pbgh.....	50.00	45.75	43.60	28.25
Op.-h'th sh. bars, Pbgh.....	50.00	45.75	43.60	28.50
Open-hearth billets, Pbgh.....	50.00	45.75	43.60	28.00
Steel bars, Chgo.....	3.10	2.79	2.77	1.79
Steel bars, Pittsburgh, contr....	2.70	2.60	2.50	1.625
Iron bars, Philadelphia.....	2.659	2.659	2.559	1.759
Iron bars, Cleveland, local del'y.	2.55	2.55	2.40	1.50

	Prices Nov. 8, 1916.	Aver. for Oct., 1916.	Average for Aug., 1916.	Aver. for Nov., 1915.
Iron bars, Chgo. mill.....	$2.45	$2.35	$2.35	$1.48
Beams, Chgo.	3.30	2.80	2.77	1.79
Beams, Pittsburgh, contr.....	2.80	2.70	2.50	1.625
Beams, Philadelphia	2.959	2.859	2.709	1.809
Tank plates, Pbgh., contract....	3.25	3.00	2.90	1.625
Tank plates, Chicago.....	3.50	3.19	3.17	1.79
Tank plates, Philadelphia.....	3.909	3.309	3.909	1.809
Sheets, blk., No. 28, Pbgh.....	3.75	3.225	2.75	2.22
Sheets, blue an., No. 10, Pbgh.	3.50	3.125	3.00	1.85
Sheets, galv., No. 28, Pbgh....	5.00	4.45	4.25	3.90
Wire nails, Pittsburgh.....	2.85	2.625	2.59	1.87
Connellsville fur. coke, contr...	3.75	3.375	2.40	2.35
Connellsville fdy. coke, contr...	5.00	4.875	3.15	2.96
Heavy melting steel, Pbgh.....	19.25	17.87	16.00	15.31
Heavy melting steel, east'n Pa..	16.50	15.50	15.00	14.50
Heavy melting steel, Chgo.....	18.00	16.50	14.90	13.15
No. 1 wrought eastern Pa.....	22.00	22.00	20.00	17.00
No. 1 wrought, Chgo.....	20.50	17.50	15.40	12.75
Rerolling rails, Chgo.....	24.50	18.75	15.70	14.30
Car wheels, Chgo.....	15.00	12.25	11.90	12.75

(For Additional Prices See Page 974.)

Pig Iron Prices Are Still Ascending

But Buying is Active and the Upward Movement is Not Ended— Extremely High Quotations Made at Buffalo, Where Iron is Becoming Scarce

New York, Nov. 7.—Jumping prices on pig iron have continued throughout the past week, and more and more the tonnage which the makers have been willing to sell has been reduced. The result is that some buyers who previously had delayed in covering are finding themselves in straits and are obliged to take whatever the furnaces will grant them both as to quantity and as to prices. Virginia iron is up $2 further, sales having been made here at $22, furnace, or $25, delivered this district, for the first half. A limited amount of Virginia iron now is being offered at $22. One leading eastern Pennsylvania maker has advanced $1 to $24, furnace, on $24.74, tidewater, for No. 2X for first half only and another has quoted this price in instances. Buffalo iron has been sold at $25, furnace. Sales of Alabama No. 1X were made here in the week at $18.50, Birmingham, and private reports have reached New York of a sale of 6,000 tons of early Alabama iron in the Cincinnati district, at $20, Birmingham, for No. 2. Buyers are bidding $17.50 for southern iron with no takers. Malleable has been quoted in the east at $28, delivered. New foundry inquiries include 2,000 tons for a Poughkeepsie buyer, first quarter; 2,000 tons for an Elizabethport shop, first half; 3,000 tons for another New Jersey machinery builder and numerous others. Buying of a Newark stovemaker for last half calls for 4,500 tons.

The Eastern Malleable Iron Co. has asked for 2,000 tons of early malleable and this is believed to be the forerunner of a large purchase. A Newark steelmaker is negotiating for 5,000 to 10,000 tons of basic. Export business continues to be checked by the higher prices. A Boston inquiry asks 5,000 to 10,000 tons of foundry for Sweden. That country has increased its recent purchases of Alabama iron. Another New York inquiry is for 7,000 tons. Further lots of export bessemer have been sold at $29, furnace, and some of this iron, at this figure is said to have gone to the valleys.

Record Prices in East

Philadelphia, Nov. 6.—In a market where the end does not yet appear to be in sight, record prices for pig iron are being commanded in practically all grades and the rising movement is being accelerated by the shrinking amount of metal now being offered for sale. Makers are doing their utmost to keep ahead of the market and after any considerable sales at one figure, immediately are moving to a higher level. Quotations are made for prompt acceptance. These conditions are responsible for rapid price changes and for rather feverish bidding for iron by consumers.

Basic in eastern Pennsylvania is up $3.50 to $4 from the last previous sale, or to $25 to $25.50, delivered. A Phoenixville, Pa., steel maker bought 22,000 tons at $25, delivered, and slightly under $25.50, delivered, for shipment beginning at once and extending to July 1. This buyer now wants further tonnage. It develops that the sale of several thousand tons of high manganese basic at $25, eastern Pennsylvania furnace, reported a week ago, was to a New England consumer. A Schuylkill valley plate maker wants 1,000 tons for delivery to an old New Jersey plant which he is about to reopen.

Standard low phosphorus has been sold as high as $44, eastern Pennsylvania furnace, and there have been other transactions at $42, eastern furnace, or $44.62, Philadelphia basis. The week's sales were 8,000 to 10,000 tons. The Bethlehem Steel Co. is inquiring for 1,800 tons, steel foundries for about 5,000 tons and Canadian consumers for a good tonnage. One Lebanon maker has advanced to $38, furnace.

Eastern Pennsylvania No. 2X foun-

(For complete prices see page 974.)

dry has been sold for first half at $24, furnace, or $24.79, Philadelphia, and some makers now have adopted that figure as their present schedule. Others have been doing $23, furnace, at which a fair amount of business has been taken. One sale of Buffalo No. 2X was done at $25, furnace, or $27.58, delivered eastern Pennsylvania. Virginia iron is difficult to quote. There have been some offerings within a few days at $22, furnace, for No. 2X, for first half, but these seem to have been absorbed. No. 2 plain has gone at $22, furnace. One maker is asking $24 for last half. High manganese Virginia has been sold at $23.75, furnace, and 4 per cent silicon at $25, furnace. Some Alabama iron is being offered here at $20 and higher, Birmingham. Foundry iron inquiry up to Jan. 1, 1918, is liberal. One lot of 2,000 tons of No. 2X and 1,000 tons of No. 2 plain are pending. Coke shortages continue to force some furnace banking. Two of the Thomas furnaces have been in this temporarily idle class.

Iron Nears $30 Mark

Buffalo, Nov. 7.—Prices continue to mount with a large inquiry pending, the further tightening of the coke situation, shortage of labor and cars and the possibility that more furnaces will be forced to bank. One leading producing interest reports that it is out of the market until Jan. 1, 1918, and remaining stacks are holding to respective minimums of $27 and $28 on practically any grades, subject to immediate acceptance and to deliveries through next year, when furnaces may have the iron available.

One interest sold a large tonnage of basic at $27.50 at the furnace for delivery over second quarter of 1917 and is now asking $28. This interest has a minimum on foundry grades, and malleable of $27. Another interest is holding off on last half of 1917 deliveries, announcing its price will be $30. Yard stocks that are available for spot delivery are held at $30 and it is expected that such iron will move shortly at that figure.

Melters booked for first half of next year are making heroic endeavors to get furnaces to make deliveries on such tonnages, if possible, during the present year, fearing the development of a more serious car shortage situation.

So much of the product of the blast furnaces is going to meet the demands of the steelmakers that iron prices are rapidly squaring with the advanced cost of steel. Up to the sweeping advances noted in the past two weeks $19.50 iron was going into steelmaking furnaces at one end and coming out at the other as a $53 product. The advances are wiping out this wide margin of costs.

Chicago Makers Ask $25

Chicago, Nov. 7.—Northern malleable and foundry pig iron has been advanced to $25, furnace, after holding at $24 for several days. Inquiry has been renewed and sales have been made freely at $24 and $24.50, and inasmuch as buyers close quickly, if at all, the new price probably will be established firmly in a short time. The inquiry now being entertained is in fair-sized lots and the aggregate is large.

High phosphorus northern iron has been selling recently on a basis of $20, Birmingham, bringing this grade to practically the same level as other northern irons.

Southern iron sales this week have been on the basis of $20, Birmingham, with some at $18.50, Birmingham. Sales are made only after being submitted to makers and quotations hold good only for immediate acceptance.

A maker of Lake Superior charcoal iron has advanced his price to a range of $24 to $25, furnace, which is equivalent to $25.75 and $26.75, delivered, Chicago.

While most melters are well covered for first half needs, present inquiry indicates there is still an unfilled demand and that those still lacking a full supply are anxious to cover before the supply is exhausted.

Prices Higher, Buying Continues

Cleveland, Nov. 7.—Advancing prices have not checked the buying of pig iron and in the first week of November one firm has sold 16,000 tons, mostly foundry grades, at $24, and above for No. 2 foundry. A round tonnage of basic has been sold at $23.50, valley, and several lots of bessemer have been sold by Cleveland firms at $26 and $27, valley. Many furnaces have sold all, or nearly all, of their estimated output up to July 1, and are taking business in a very conservative way for the last half of next year. One Cleveland company which has been out of the market is now taking orders for limited tonnages, principally foundry grades, on which the market ranges from $24 to $25, furnace.

Sharp Advances Continue

Pittsburgh, Nov. 7.—The presidential election has failed to affect the general iron and steel market in any way. Pig iron buying has continued active and further sharp advances in prices have been registered. Bessemer pig iron has been sold at $28, basic at $23 and foundry and malleable grades are being held at $26, valley. The Carbon Steel Co., Pittsburgh, has purchased about 3,000 tons of bessemer pig iron for first quarter delivery at prices ranging from $26 to $27, furnace. Another Pittsburgh consumer has paid $28, valley, for 2,000 tons of bessemer iron for delivery the first three months of next year. A southern Ohio interest has sold 2,000 tons of bessemer iron at $28, delivered, Pittsburgh. The General Electric Co. has closed for 1,000 tons of No. 3 foundry iron at $21, southern Ohio furnace, for shipment to Erie, Pa. Most dealers are asking $26, valley, for foundry and malleable irons and small tonnages have been sold at that figure. We note a sale of 2,000 tons of foundry iron at $25.50, furnace. Basic iron now is being held at $23, valley, and a fairly heavy tonnage, involving about 10,000 tons, has been sold at that figure. The American Steel Foundries has not yet covered its basic pig iron requirements for the first half of next year; the company likely will buy from 15,000 to 20,000 tons. Another interest in this district is negotiating for its basic iron requirements the second half of 1917.

(For complete prices see page 974.)

More Active at St. Louis

St. Louis, Nov. 6.—The pig iron industry is improving in this market, with the following inquiries out: Car wheel iron, 4,000 tons; charcoal iron, 2,000 tons; coke iron, 2,000 tons; northern malleable, 2,000 tons. Sales last week amounted to upwards of 15,000 tons, consisting of various grades. Prices are strong, and local sales agents are optimistic. Southern No. 2 is held at $19.50 to $21 for prompt delivery, and $19 to $20 for rest of the year. Northern iron is firm at $25, Chicago, and $24 to $25, Ironton.

Rapid Changes in South

Birmingham, Ala., Nov. 6.—The past week has been another spectacular one, prices changing over night at times. Before Monday night, prices were firmly established at $17 per ton basis—an advance of 50c per ton. The week closed with the market firm at $18 per ton, No. 2 foundry basis, f. o. b. cars at the furnace. In some instances, special lots of iron were sold as high as $20 per ton at the furnace. One producer sold 4,000 tons for export at $20 per ton at the furnace. Practically all the furnace companies in the district are out of the market, and only scattering lots are heard of as having been sold. The Birmingham district is just now beginning to come to the realization that the great increase in steel-

making capacity, without a corresponding increase in blast furnace capacity, is throwing its heavy weight in the foundry iron balance and that foundry iron must swing upward regardless of whether the general foundry conditions will or will not justify the advance in price. It looks as though this condition would never be realized, and for that reason many doubted that the great scarcity of basic iron would have a telling effect on foundry iron. However, these prosperous conditions now obtain in the district, and as a result the different iron companies are voluntarily advancing the price of labor.

Wild at Cincinnati

Cincinnati, Nov. 7.—The tentative price of southern No. 2 foundry iron is now $20, Birmingham basis, for the first half of next year. Even at this figure, all quotations are subject to confirmation by furnaces before orders can be placed. The market is running wild. Last Friday, $17, Birmingham basis, for the first half of next year could be done. On Saturday, this price was advanced to $18.50, and today $20 is the minimum quotation. It is almost certain that the price at the end of the week will be several dollars higher. No quotations are out for the second half of 1917. The price of southern Ohio No. 2 foundry iron is $23, Ironton basis, for the last half of 1917. It is not known that any iron is available for the first half. Silvery iron is strong and has advanced to $30, furnace, for 8 per cent silicon, for first half delivery. Southern silvery iron can be had between $4 and $5 a ton lower.

Demand for all grades of iron is now in excess of supply. Not all furnaces are sold up for the first half of next year, but a large number are refusing to sell at present quotations, as they expect the market to go much higher in the near future. The Hamilton Foundry & Machine Co. has purchased between 3,000 and 4,000 tons of northern and southern foundry grades, and is still in the market for 3,000 tons to extend into the second half of next year. The Louisville & Nashville railroad has an inquiry out for from 1,200 to 2,000 tons of foundry iron for delivery over the remainder of this year, and the first half of next year.

Acquires Furnace Plant

Birmingham, Ala., Nov. 6. — The Matthews Iron & Mining Co. formally acquired from the Michigan Trust Co., of Grand Rapids, Mich., the furnace plant of the old Silver Creek Furnace company at Rome, Ga., also a 10-year lease on 320 acres of high-grade red ore lands located within 18 miles of the furnace plant. The company is headed by H. S. Matthews, former president of the Alabama Consolidated Coal & Iron Co. (now the Alabama Co.). Work of rehabilitating the furnace plant and the building of two miles of railroad to the red ore mines is now under way. The capacity of the plant will be 100 to 125 tons per day of special analysis iron, of high manganese low phosphorus content. The company will begin operations on basic iron, having in hand orders for six months' operation. Surplus ore will be sold on the market.

Tariff Rates

Proposed by Railroads Suspended by Interstate Commerce Commission

Washington, Nov. 7. (By wire.)—The interstate commerce commission late this afternoon made public an order suspending from Nov. 10 and later dates until March 10 the operations of the tariff filed by the railroads canceling existing commodity rates on iron and steel articles, in carloads, between Chicago and related points and various points in western trunk line territory. The increases proposed in the tariffs range from 40 to 50 per cent and affect about 80 steel products. The suspension follows the request made last week by steel producers and consumers that the commission take such action. The commission will enter upon formal hearings as to proposed rates.

Chain May Advance

Pittsburgh, Nov. 7.—The market for steel chain reflects moderate strength. Some mills are refusing to shade 5.50c and it is not unlikely that 6c soon will be quoted. However, the 5c price is still quoted.

Plate Mill Contracts

Philadelphia, Nov. 7.—Contracts for two plate mills at its Sparrows Point plant have been awarded by the Bethlehem Steel Co. One of these will be a 110-inch sheared and the other a 40-inch universal mill. These mills are a part of the elaborate program of finishing extensions which the Bethlehem company is developing at Sparrows Point. They will be the first plate mills to be included in the company's finishing plants and have been required by its extensive ship yard activities.

Ferro Contracting

Shows Some Activity—Prices Show Spread of $5

New York, Nov. 7.—Contracting for ferro-manganese for 1917 delivery, which up to this time has been done only lightly, now shows some activity and several large tonnages have been closed or still are pending. One of the steel works producers is understood to have taken 4,000 to 5,000 tons of business for 1917 delivery from various consumers. There are inquiries in the market for not less than 10,000 to 15,000 tons, a considerable portion of which is for one large consumer. Deliveries on these lots are wanted throughout the full year of 1917. Prices on ferro-manganese still show a spread of about $5 per ton. It is understood that on large and attractive business, $160, furnace, was done by steel works producers and this appears to be the inside price for sizeable lots. Small sales of domestic metal continue to be made up to $165, delivered. English producers still are quoting $164, seaboard, but have been taking little new business.

Spiegeleisen also has shown increased activity and new sales in excess of 5,000 tons have been made. The price for first half seems to be well settled at from $43 to $45, for 20 per cent, but $40, furnace, has been done for shipment beyond July.

Bids Not Accepted

Philadelphia, Nov. 7.—Bids of 60 cents per unit at tidewater for 50 per cent manganese ore have not been acceptable to sellers who are holding for from 65 to 70 cents at tidewater. Offerings are limited, especially in Brazilian ore which is scarce.

Bethlehem Buys

Philadelphia, Nov. 7.—The Bethlehem, Pa., steelmaker has bought 2,000 tons of 11 to 12 per cent bessemer ferro-silicon against an inquiry for 3,000 to 6,000 tons for first half. This metal now advanced to $42, Ohio furnace, for 10 to 11 per cent, to $43 for 11 to 12, and to $44 for 12 to 13.

Ferro-Silicon Higher

Pittsburgh, Nov. 7.—All sellers of lower grades of bessemer ferro-silicon now are quoting on the basis of $35, furnace, for 10 per cent. Rather heavy tonnages have been sold on that basis for shipment the first three months of 1917. No change is noted in the situation for ferro-manganese. Spiegeleisen has been advanced $5 a ton to $50, furnace, for delivery in the first quarter. Rather heavy tonnages of this material were sold last week at $45, furnace.

(*For complete prices see page 974.*)

Bars Active

And Sellers are Doing Their Best to Satisfy Customers

Pittsburgh, Nov. 7.—Heavy demand exists for steel bars for the manufacture of munitions and for shipment abroad. Specifications from domestic consumers are very heavy. Some mills are offering steel bars for shipment at their convenience at 2.70c, but other interests are refusing to shade 2.80c. Consumers of bars are complaining more vigorously about deferred deliveries, which have made it impossible for some manufacturers of finished products to operate at maximum capacities. Bar iron continues to be offered at a range from 2.65c to 2.75c for future delivery. Refined bar iron is commanding as high as 3.25c.

Steel Bars Steady

Chicago, Nov. 7.—The situation as to finished steel is unchanged from recent weeks, except that all conditions have become intensified. Production and shipment by important mills are being increased steadily, and October set new records in many instances. Sales by those interests still taking business are much in excess of shipments, and specifications are being received at a rate even heavier than new sales.

The quotation on steel bars is 2.89c, Chicago mill, for delivery at convenience, and there is small opportunity for buyers to obtain material for near delivery even by paying a premium.

Among the buyers inquiring for and contracting for material during the past week were a number of agricultural implement makers who placed contracts for lots ranging from 2,000 to 5,000 tons of bars for uncertain delivery, which, of course, means late in 1917. The regular market quotation was paid on all these contracts.

Hard steel bars rerolled from rails have been advanced by some interests from 2.50c to 2.60c, Chicago mill, and a further advance, possibly to 2.75c, Chicago mill, is forecasted. This advance comes about from the strong demand for this material and also partly on account of the unusual high cost of rerolling rails from which the high carbon bars are produced.

Bar Bids Not Acceptable

Philadelphia, Nov. 6.—Bids of 2.90c, Pittsburgh, or 3.059c, Philadelphia, from consumers in this district, for fair quantities of steel bars to be shipped at mill convenience, have not proved acceptable to the makers thus approached. Most of the producers care for very few new orders at present and require that only specific lots shall be considered. Small orders continue to be taken at 3.00c, Pittsburgh. The 2.70c, Pittsburgh, price remains largely nominal. Independent producers are naming from 2.80c to 2.85c, Pittsburgh.

Selling Policy

Cleveland, Nov. 7.—The policy of sales agencies in regard to bars and also shapes and plates is to take up every individual case and do as much as possible to satisfy customers. Old customers are being treated with the greatest consideration possible, but the buyer who has flitted about from one company to another is having a hard time. Special effort is made to keep up continuous shipments and not allow any hiatus. For example, if a consumer has a contract for bars which at the present rate of delivery will be delivered in six months, it is arranged, whenever possible, to have additional tonnage begin with the expiration of deliveries on old contracts.

Bar Iron Strong

Chicago, Nov. 7.—Comparatively little selling of bar iron is being done at present, principally because most users have covered already for their requirements through the present year and in most cases through first half of next year. The minimum quotation appears to be 2.40c, Chicago mill, but this is becoming increasingly difficult to obtain, and sales are being made as high as 2.50c, Chicago mill.

Considerable tonnages of iron bars have been contracted by railway car builders who are substituting iron for steel in many places where it will serve equally well, because deliveries on iron may be obtained within a few weeks or months, while steel is delayed far into next year.

One important producer in the Chicago district is out of the market for the present, and has nothing to sell for any delivery until further announcement.

Hoops and Bands

Pittsburgh, Nov. 7.—No change is noted in the situation for hoops and bands, which are held at 3.25c and 2.75c, respectively, as a minimum for delivery at the convenience of the mill. Most makers are unable to promise additional tonnages for shipment before the latter part of the second quarter of 1917. Scarcely any tonnage is available for delivery this year.

Shafting

Pittsburgh, Nov. 7.—No important change is noted in the market for cold rolled steel shafting. Material for shipment the first quarter of next year is being offered at a range from 10 to 20 per cent off. It is not unlikely that quotations below 10 per cent off the list soon will disappear.

Cold Rolled Strip Steel

Pittsburgh, Nov. 7.—Manufacturers of cold rolled strip steel are selling material for shipment the first three months of 1917 at 6.50c, base, and above. So far as can be learned, no tonnage is being sold for delivery after March 31, although some makers will not be able to fill their obligations until the second quarter of next year. For nearby shipment, as high as 11c has been paid.

(For complete prices see page 974.)

Wire Prices

Again Have Been Advanced and are Highest Since 1900

Pittsburgh, Nov. 7.—The American Steel & Wire Co., under date of Nov. 4, put up prices of all wire products $3 a ton, the sharpest advance recorded in more than a decade. Prevailing prices are the highest since the early part of 1900, when the John W. Gates' interests advanced material $5 a ton to $3.20 for nails. Nails have been advanced $20 a ton in the last 12 months, and 12 changes in wire prices have been made since Jan. 1, last. Some manufacturers lowered discounts for wire fencing to 55 off, but others nominally are quoting 56 off the list. Cement-coated nailmakers now are asking $2.75 a keg, or $3 a ton above the previously prevailing quotation.

The general wire market, an analysis indicates, never was stronger than it is today. Mills have scarcely any material in stock and most concerns have enough tonnage on their books to maintain in present operating rates for from six to nine months. Specifications against contracts are exceedingly heavy and considerable new demand is reported.

The last previous change in prices was made under date of Oct. 19, when a $2 a ton advance was made.

Wire Nails Scarce

Buffalo, Nov. 7. — For the first time since the outbreak of the European war agencies report a scarcity of wire nails. One interest reports an offer of $68 per gross ton, Pittsburgh, on wire rods, but that the order was unable to find placement.

The holdings of the Union Coal & Coke Co., Marianna, Pa., have been sold to the Midvale Steel & Ordnance Co. and the Cambria Steel Co., Philadelphia.

Sheet Prices Irregular

Some Very High Quotations Announced—Inquiry for 10,000 Tons for Japan Does Not Result in Order

Youngstown, O., Nov. 7.—Prices in the sheet market are growing more irregular. The 3.65c price on black sheets announced a few days ago by the country's leading interest is below the prices being quoted by independents. Some mills are asking as high as 4.25c for black sheets and a fair tonnage has been sold at 4c. Blue annealed sheets, which have shown comparatively little activity for several weeks, are given in demand and 3.75c is being asked by some independents. Galvanized sheets are active and are being quoted as high as 6c.

The foreign demand continues to engage the attention of sales managers, although the volume of such sales has declined owing to the reluctance of the mills to add to their heavy advance bookings. Exporting firms are bending every effort to get mills to accept tonnage and prices are of secondary importance. One order for 10,000 tons of black sheets, No. 30 gage, 36 x 72 inches, for delivery in Japan, has been put before most of the mills in the country without success.

Some unusual expedients are being tried by some firms to get mills to accept export tonnage. One favored method is to try to persuade a regular mill customer to specify certain tonnages in sizes desired by the exporter, the domestic consumer thus serving as a middleman. Producing mills are reluctant to accept such business.

Consumers apparently are paying less attention to prices than they were before the present advancing market set in. Some buyers of galvanized sheets for instance, who held aloof from the market for more than a year, are now buying freely. Independent makers are generally asking 5.50c for the coated sheets, while one mill is holding at 6c.

Blue annealed sheets both for domestic and foreign consumption have sold freely at 3.75c lately. One big eastern mill bought 500 tons of blue annealed sheets at 3.75c this week.

An interesting sidelight on the great strength of the sheet market at this time was the statement made by one sales manager today that some tonnages sold to exporters 60 days ago would bring twice as much today.

The reluctance of sheet mills to contract to capacity for the first quarter is partially the result of the present congestion of their rolling schedules. Deliveries of sheet bars have not been as good recently, due to the pressure on the steel mills and to the car situation. This is proving one factor in forcing a large tonnage, booked for delivery in this quarter, to be carried over into the first quarter of next year. One mill manager stated today that he would carry over one-half of his present bookings for the current quarter into the first quarter.

The shortage of cars is proving a serious deterrent on mill operations, as outgoing shipments are irregular. The coal situation has not hampered mills in this district, some having contracted ahead months ago while deliveries on contracts are being well maintained.

Sold Far Ahead

Canton, O., Nov. 6.—The sheet producers in this district are so well sold ahead that most of them will carry considerable of their last quarter tonnage into 1917. One company has sold practically all of its black sheet tonnage for the first half of the new year. The foreign market is drawing little tonnage from local mills, and much of the domestic demand has to be turned down.

Black sheets are selling at from 3.75c to 4c. Blue annealed is in heavy demand at 3.50c to 3.75c, and the mills are well booked up for the first quarter of 1917. Galvanized sheets are bringing from 5c to 5.50c, which is considered by producers a reasonable price in view of conditions in the steel and spelter markets. Because of the high and uncertain prices of spelter, one of the principal manufacturers of galvanized sheets in this territory will not open any part of his 1917 books before Nov. 15.

Sheet Prices Advanced

Pittsburgh, Nov. 7.—As generally expected, prices of steel sheet products have continued their march toward higher levels. Bessemer black sheets have been advanced $5 a ton to 3.65c by the American Sheet & Tin Plate Co., and the lighter gages of blue annealed products have been put up similarly. Galvanized sheets are being held at as high as 5.50c, and some tonnage has been sold at that figure. Some of the larger manufacturers virtually have withdrawn from the market for shipment before the early part of 1917.

Inquiries, both for export and domestic shipment, are more numerous and involve heavier tonnages than previously. As a rule, makers are not entertaining inquiries for shipment abroad, because of the tremendous demand existing in this country.

Railroad Business

Philadelphia, Nov. 6.—Large recent awards of steel passenger equipment by the railroads are bringing out some sizeable orders for both light and heavy blue annealed sheets for construction purposes. One order for about 500 tons covering 60 coaches was placed with an eastern mill. About 3,000 tons will be required for a large New York Central order just distributed. The sheet market in the east continues active with all classes of buyers participating and contracting covering both the first and second quarters is being done. The 3.25c, Pittsburgh, price on No. 10 gage blue annealed is disappearing and the market is hardening at 3.50c. A liberal export inquiry continues to appear.

Strong at Chicago

Chicago, Nov. 7.—Strength continues to be manifested in the market for steel sheets. Black sheets are advancing more rapidly than blue annealed, and are assuming more nearly the usual relation, which had been disturbed for several months. No. 28 gage black sheets now are quoted at 3.94c, Chicago mill, while No. 10 blue annealed may be obtained at 3.44c to 3.69c, Chicago mill.

No. 28 gage galvanized sheets may be obtained still at 5.19c, Chicago mill, but an advance from this figure would not be surprising.

Unwilling to Quote

Cleveland, Nov. 7.—The demand for sheets is very active and on blue annealed it is difficult to obtain quotations on account of the filled-up condition of mills. Quotations on this product have advanced from $15 to $20 per ton in the past six weeks. One inquiry on several carloads was submitted to a number of mills which did not care to quote.

The American Forging & Socket Co., Pontiac, Mich., announces that it has obtained the services of W. J. McKechnie as general manager. Mr. McKechnie has resigned as auditor of industrial accounts of the Richards Audit Co. of Detroit and has become a stockholder and director of the American Forging & Socket Co. He was formerly associated with the Winkley Co., of Detroit, and was for four years chief accountant of the Rutenber Motor Co., Marion, Ind. The American Forging & Socket Co. has been doing an extensive business in forgings and bow sockets with automobile manufacturers for the past 10 months.

(*For complete prices see page 974.*)

Structurals for France

Additional Purchase of Ten Thousand Tons from a Pennsylvania Maker—Railway Buying is More Active

New York, Nov. 7.—As the end of the year approaches, bringing with it the termination of many contracts for plain material, on which prices are from $10 to $20, and even more, under the current market, a more erratic condition in fabricated material competition has developed and prices show a wider spread of from $10 to $15, per ton. Holders of these contracts for plain material, apparently, are making extra efforts to take advantage of the unshipped portions by striking out for fabricated tonnage. The volume of new work remains only fair. Some of the mills are following closely the inquiry for 45,000 to 50,000 tons of plain structural shapes for first half recently put out by the French government, as noted a week ago; others are not interested at all as they are so obligated on their output that they cannot spare the steel. The going plain material price remains 2.85c, Pittsburgh, or 3.019c, New York.

France Buys Beams

Philadelphia, Nov. 6.—An additional purchase of 10,000 tons of beams for first quarter has been made by the French government of a Pennsylvania maker under an option which now has been exercised. This tonnage is not included in the 45,000 tons of beams and angles for first half for the French government recently inquired for by J. P. Morgan & Co. One eastern Pennsylvania shape mill started quoting this week on a flat 3.00c, mill, or 2.93c, Pittsburgh, basis and has taken some business at this price, including one order for 2,000 tons to be shipped at the maker's convenience. Other eastern makers are quoting 2.85c, Pittsburgh, and upward. A number of buyers are in the market for additional tonnage, but the mills are forced by their heavy obligations to take new orders very conservatively. The Southern railway has closed with eastern producers against a recent inquiry for 2,500 to 3,000 tons of car shapes.

More Active

Pittsburgh, Nov. 7.—New demand for structural material is heavier than it has been for many weeks. Consumers, apparently believing that prices will go much higher before declining, are beginning to buy tonnages, inquiries for which first went out many months ago. Fabricating shops in this district are operating at maximum capacity and many of them have been forced to call upon warehouses for material, on account of deferred mill deliveries. Structural shapes are being held at 2.80c and above for delivery at the convenience of the mill.

Shapes in Demand

Chicago, Nov. 7.—Demand for steel shapes is developing into a feature of the finished steel market. This is not so much for structural purposes as for car building into which small shapes enter largely. Recent contracts placed in the west for structural material include 3,000 tons for a terminal freight house in Chicago for the Chicago, Burlington & Quincy railroad, a part of the new union station development, which will be fabricated by the American Bridge Co. Other western business was for small tonnages.

The present quotation on structural shapes is 2.99c, Chicago mill, for indefinite delivery.

Railroad Bridges

Cleveland, Nov. 7.—The demand for structural material for new buildings is not very active, but railroads are showing more disposition to contract, and a Cleveland bridge builder has been given protection on from 3,000 to 4,000 tons of steel for bridges for the Great Northern railroad. Delivery is to be made the second quarter of next year.

CONTRACTS AWARDED.

Hangars for United States Government at various locations, 1,000 tons, general contract to Pruden & Co., Washington, and steel placed with independent shop.

Penn Bridge Co., 400 tons for the Co-Operative Stove Co.

Riverside Bridge Co., 400 tons for the National Tool Co., for which Hunkin-Conkey Co. have the general contract.

American Bridge Co., 4,000 to 5,000 tons for the additions to the Firestone Tire & Rubber Co., Akron, O. The Osborne Engineering Co. has the general contract.

Chicago, Burlington & Quincy Railroad Co., terminal freight house, Chicago 3,000 tons, to American Bridge Co.

Inland Steel Co., roundhouse at Indiana Harbor Works, 231 tons.

Eastman Kodak Co., Rochester, large plant addition, taking 1,000 tons reinforcing material, contract to Hydraulic Co., Cincinnati.

International Acheson Graphite Co., Plant No. 3, Niagara River, near Buffalo, 400 to 500 tons steel, contract to Buffalo Structural Steel Co.

CONTRACTS PENDING.

Section of Broad street subway, Philadelphia, 800 tons, bids being taken.

Rolling mill and brass foundry for the Cleveland Brass & Copper Co., Cleveland, 600 to 700 tons, bids being taken.

Lamp works for the General Electric Co., Providence, R. I., 1,000 tons, bids being taken.

Y. W. C. A. building, Hartford, Conn., 400 tons, bids being taken.

Additions to the plant of I. P. Thomas & Sons Co., Paulsboro, N. J., 600 tons, bids being taken.

Bridge work for the Southern railway, 700 to 800 tons, bids being taken.

(For complete prices see page 974.)

Tin Plate Price

Has Been Withdrawn by American Sheet & Tin Plate Co.

Pittsburgh, Nov. 7.—The American Sheet & Tin Plate Co., which, on Oct. 19, opened its books to consumers of tin plate at $5.75, base, for shipment the first half of 1917, on Nov. 6 withdrew its price, having sold, in 19 business days, all the tonnage it could offer for shipment before July 1, next. Other tin plate makers virtually have withdrawn from the market. Pressure for material never before in the history of the trade was heavier than it is at present. Consumers, unable to cover requirements through usual sources, have sent inquiries broadcast in an effort to obtain desired tonnages. Most independent manufacturers have adhered strictly to the $6 quotation put out about a week before the American company opened its books, and considerable tonnage has been sold at that figure and above. For export, as high as $6.50 has been paid. A far eastern consumer has entered the market for 400,000 base boxes, although it is said that this concern will buy several million boxes, if material is available.

Large Orders Refused

Cleveland, Nov. 7.—Leading independent tin plate manufacturers have declined to take large orders which have been offered during the past few days and are unwilling to quote at the present time, but it is understood that the smaller concerns are booking considerable business.

Bolts and Nuts

Will Probably be Advanced at Early date—Also Rivets

Pittsburgh, Nov. 7.—An early advance in the price of nuts, bolts and rivets is expected. Some mills now are obtaining considerably above generally prevailing prices, which were put out when bar stock was offered at $2 a ton less than the prevailing price. Deferred deliveries of bars are causing nut, bolt and rivet makers no little inconvenience.

Plate Prices Marked Up

Eastern Pennsylvania Mills Advance Sharply, Marine Boiler Steel Being Quoted at $208 Ton—Buying by Ship Builders Heavy

Philadelphia, Nov. 6.—Recent talk of higher prices for plates among eastern makers has been translated into definite action by some mills, as the demand continues tremendous and is overflowing rolling capacities. One prominent producer has marked up his schedule $15 a ton to 4.75c, base, Pittsburgh, or 4.909c, Philadelphia. For ship plates 5.00c to 5.50c, Pittsburgh, now is named and for marine boiler steel 10.40c, Pittsburgh. The price movement with other makers is upward, but not in so pronounced a way. The 3.50c, Pittsburgh, price on tank or universal plates is being accepted more sparingly and 3.75c is more representative while 4.00c orders are not uncommon. Some heavy tonnages of universal plates taken this week by eastern makers, chiefly from car builders, have filled capacities for a number of months and there is now less price variation between this quality and sheared. The past week has witnessed another large influx of new inquiries. The makers have so much tonnage in sight that they are more strictly enforcing immediate decisions on quotations.

Ship steel booking and inquiries are heavy. The Sun Shipbuilding Co. has bought new lots of steel for both the first and the second halves of 1918. The first half order was for 8,000 tons at 3.25c, Pittsburgh, taken by the largest maker. The tonnage and the price for the second half order covering practically two years ahead on the most extended contract yet heard of, have not been given. One large maker with mills both in eastern and western Pennsylvania booked 25,000 tons of new ship plate business in the week. A new Seattle shipyard bought 15,000 to 20,000 tons of ship plates for six boats from the Lackawanna Steel Co. for first half of 1918 at a reported price of 4.50c, Pittsburgh, and about 1,000 tons of boiler steel from an eastern mill. Car builders have made further requests for large tonnages. The American Car & Foundry Co. bought 5,000 tons and the Southern Railway 1,000 tons of universal plates for two eastern makers. Large buyers of plates in miscellaneous lines are offering to contract at ruling prices as far ahead as the mills will permit.

Sold at Wide Range

Pittsburgh, Nov. 7.—Steel plates are being quoted at a wide range in prices by manufacturers in western Pennsylvania. The Carnegie Steel Co. is asking 3.25c for delivery at its convenience; one independent concern is quoting 3.50c for future delivery and still another interest is refusing to shade 4c for either prompt or future shipment. It conservatively is estimated that fully 25,000 cars were purchased last month by manufacturers in this country. The more important orders include, 5,000 cars for the New York Central Lines; 3,500 for the Louisville & Nashville; 2,500 for the Union Pacific, and 2,000 each for the Baltimore & Ohio and the Philadelphia & Reading railroads. Pittsburgh mills will furnish a large part of the steel involved. Ship building interests continue to play an important part in the market, buying for delivery the latter part of 1917 and the early part of 1918. Predictions have been made recently that steel plates will command 5c next year, unless some unforseen trade reversal occurs. Some tonnage for immediate shipment already has been sold at as high as 4.50c.

Seek Plates for Cars

Chicago, Nov. 7.—Unusual sales of freight cars in the west during the past week, aggregating over 10,000 cars, the steel for which was placed with western mills for the most part, brought a heavy demand for steel plates. This is in addition to the already strong demand for this material for ship building and ordinary uses, and the plate market is strong in proportion.

The present quotation is 3.44c, Chicago mill, and opportunity to obtain nearby delivery by payment of premiums is slight.

Higher Quotations

Cleveland, Nov. 7.—Eastern mills which have been quoting 3.75c, mill, on universal plates and 4c for sheared plates, for western shipment, have advanced their quotations to 3.75c and 4.75c, respectively. Delivery on sheared plates is from six to eight months. Local mills, while continuing to quote during the past week or two, report the market very strong, and it is probable that higher prices will be announced. Inquiry from foreign countries continues active.

Large Order Received.—The Hydraulic Press Mfg. Co., Mt. Gilead, O., has received an order from the Goodyear Tire & Rubber Co., Akron, O., for 70 hydraulic hot plate presses to be used for vulcanizing purposes in the Goodyear rubber plant at Akron. They will be operated from hydraulic pump and accumulator systems already installed. During the past two years, the plant of the Hydraulic Press Co. has been operated at full capacity and practically all of its business has been for hydraulic machinery other than that used in the making of war muniitons.

(For complete prices see page 974.)

Cast Iron Pipe

Heavy Buying by Gas and Water Companies Continues

New York, Nov. 7.—Heavy buying of cast iron pipe by gas and water companies for forward delivery continues and some of these contracts provide for shipment throughout the entire year of 1917. Others are for the first half. The buyers, apparently, are anticipating further price rises and makers, in fact, state that additional advances are only a matter of days if the higher movement in pig iron is continued. The recent price advance of $1 per ton is being well maintained. The Warren Foundry & Machine Co. received the 2,100 tons for Newark; $31.42, delivered, for the 6's to 12's, and of $30.63, delivered, for the 16's to 36's. R. D. Wood & Co. took 570 tons for the city of New York at $32.94, delivered, for the 6's; $34.34, delivered, for the 8's, and $69, delivered, for the specials.

Water Pipe Up $1

Chicago, Nov. 7.—An advance of $1 per ton has been made on cast iron water pipe, and a further advance seems likely to be made within a short time under the constant upward pressure of pig iron prices. This advance brings 4-inch pipe to a level of $35.50 to $36, and 6-inch and larger under the new schedule is $32.50 to $33.

Comparatively little business is being entertained, and few sales are being made.

Chicago's Needs

Chicago, Nov. 7.—The city of Chicago will open bids next week on two large lots of cast iron water pipe for next year's delivery. The aggregate of the two lettings is 18,125 tons, and there will be two lettings. Bids will be taken Nov. 14 on 8,125 tons of 16, 24, 30 and 48-inch pipe and Nov. 15 on 10,000 tons of 4, 6, 8 and 12-inch pipe.

F. A. Cornell has resigned as manager of the Perfection Spring Service Co., Cleveland, and has accepted the position of assistant sales manager of the Cole Motor Car Co., Indianapolis.

Very High Scrap Prices

Have Been Reached at Chicago and Other Centers—General Advances at Cleveland—Stationary at Cincinnati

Chicago, Nov. 7.—Prices being reached by scrap in Chicago almost pass belief. All classes of consumers are inquiring and buying, and the result has been an apparent shortage, in view of the fact that railroads are not preparing and marketing their accumulations in as heavy tonnages as usual. Yard scrap is not as scarce as the railroad varieties, but prices are being carried up in sympathy.

Rerolling rails, which have been mounting steadily, are now quoted at $24.50 to $25 per ton, and are difficult to obtain even at that price. Railroads apparently are not doing so much track work or are keeping their rails in track longer than usual, and the supply is decidedly short. No. 1 railroad wrought is now quoted at about $21, and No. 2 railroad wrought at about $20. Other items are high in proportion.

Railroad listings do not contain much material, and only a few are now being considered by the trade. The Wabash railroad is offering 1,000 tons, the Mobile & Ohio railroad 600 tons, the Soo Line 500 tons, and the Kansas City Southern 75 tons.

Buyers Not Interested

Philadelphia, Nov. 6.—Contrary conduct to that of the remainder of the market and to the action of the same grade in other districts continues to be shown by heavy melting steel in eastern Pennsylvania. The eastern steel makers still report their stocks are so heavy that they are not interested in new purchases except at inducement. The brokers are buying some steel at $17 to $17.50, delivered, either to apply against old orders here or against new business taken in outside districts. All other grades besides steel are strong and active and prices show a steady advance. Buyers are more inclined to close new orders for future delivery than the sellers are to accept them.

Price Advances Rapid

New York, Nov. 7.—Active demand for old material is current in all grades except the lighter classifications and price advances have been more rapid the past week, averaging $1 or more. Eastern Pennsylvania steel works now are coming out as buyers of heavy melting steel and will pay $17 to $17.50, delivered, but can attract little material at these prices. Material has been offered at $18. The Pittsburgh district continues to draw on the east for steel and brokers are paying $16.25 to $16.50, New York. The Pittsburgh district also is offering $10.25, delivered, on turnings. Shafting buyers will pay $23, delivered eastern Pennsylvania. Cast grades are advancing sharply in sympathy with pig iron. There is demand for car wheels but prices are not clear.

Buoyant at Buffalo

Buffalo, Nov. 7.—The local old material market is reported strong and buoyant by the leading dealers. Further increases in prices are noted in many of the lines in the list, including heavy melting steel, railroad malleable, railroad wrought, car wheels, grate bars, cast borings and other items. Large sales continue to be booked at the advancing prices. A feature of the market is the activity of dealers who were sold short and who are now paying higher prices than consumers for the same lines to meet their obligations.

Prices Advance Further

Pittsburgh, Nov. 7.—All grades of iron and steel scrap continue to reflect strength. Heavy melting steel is being held at $19.50, and Youngstown consumers have paid $19.75 for rather heavy tonnages. Re-rolling rails, which are extremely scarce, have commanded as high as $22 a ton and low phosphorus steel scrap also is selling at that figure. Iron and steel axles for export have commanded $40, Pittsburgh. Demand for machine shop turnings and borings is heavy. None of the larger mills in this district has been buying heavy melting stock recently.

Middlemen Buying

Cleveland, Nov. 7.—All usually active grades of scrap have risen in price from 25 cents to $1 a ton during the past week due to heavy buying by middlemen on old orders and on buying by foundries and rolling mills. The market is unusually strong with an inclination to rise still further. Local steel mills have not entered for new requirements and their offers are about $1 less than dealers' going prices. Youngstown and eastern Ohio mills have come in for tonnages, thus affording a market for heavy melting steel, but the trading is not attractive there at the offers.

Machine shop turnings have strengthened somewhat as shown by the latest sales, the maximum price rising to about $6 a net ton, this city. Cast borings hang around the same level as quoted for several days. Malleable iron scrap and steel rails under 3 feet in length, such as are used in foundries, have seen spectacular advances when an apparent scarcity had suggested itself. On the whole, the market is strong, but uncertainty as to the future movement of prices is causing dealers to act with exceptional caution.

(*For complete prices see page 974.*)

Stationary at Cincinnati

Cincinnati, Nov. 6.—The scrap market has been stationary during the past week, and from all indications no changes in prices will be made this week. Melters in Youngstown, O., are offering around $17.50 per gross ton, delivered, for heavy melting scrap, which is a little better than $15.50 per gross ton, Cincinnati. One rolling mill in this territory paid $16.25 per gross ton, f. o. b. Cincinnati, for a small lot of heavy melting steel last Saturday. No. 1 yard wrought has been selling in good lots recently at prices ranging all the way from $13.50 to $14.50 per net ton, Cincinnati. Borings and turnings remain weak, principally because demand has not exceeded supply.

Strong at St. Louis

St. Louis, Nov. 7.—The scrap market continues strong, and dealers are anxious to secure everything available for delivery on old orders. Consumers are buying liberally, as they realize that scrap is not moving freely, and probably are well aware that a serious shortage is close at hand.

The railroads are making strenuous efforts to accumulate tonnages, but equipment is so scarce that it is a question whether they will consider it good policy to use the cars necessary for the transportation of old material. Relaying rails are very scarce and prices are advancing steadily. The only railroad offerings before the market are: Wabash, 1,000 tons; Kansas City-Southern, 300 tons; Mobile & Ohio, 600 tons; San Antonio & Aranzos Pass, 300 tons.

The System federation, composed of the various shop crafts employed by the New York, New Haven & Hartford Railroad Co., has made demands for two and one-half cents increase per hour in wages. It affects about 5,000 men, all of whom are affiliated with the American Federation of Labor. The federation demanded 4 cents last spring and 1½ cents was granted. It now wants the difference on a nine-hour day basis.

Ore Shipments

For the Season Make a Total of of 58,000,000 Tons

Ore shipments during October were 9,116,196 gross tons, a gain of 1,969,323 tons over movement of October, 1915, when 7,146,873 tons were shipped. This movement is heavier than was expected, and in spite of the delays brought about by the shortage of cars, the October figures show a decrease of only 478,196 tons from the September shipments. The movement to Nov. 1 aggregated 57,932,846 tons, compared with 41,816,439 tons shipped to Nov. 1, 1915. The 1916 figures as of Nov. 1 show an increase of 8,862,268 tons over the total movement for the season of 1913, the record year in the ore trade, when 49,979,478 tons were brought down. It is certain, therefore, that the total season's shipments for 1916 will be near 63,000,000 tons. To accomplish this the fleet will have to move approximately 5,067,000 tons from Nov. 1 to the close of the season. Owing to the light grain movement, it is predicted that the bulk of the steel vessels will carry ore during the first half of November.

Following are the shipments by ports for October and up to Nov. 1, 1916, with comparative date for 1915:

	October, 1915.	October, 1916.
Escanaba	928,399	876,488
Marquette	522,671	519,806
Ashland	866,170	1,218,134
Superior	1,351,893	1,732,865
Duluth	2,301,352	3,298,314
Two Harbors	1,176,388	1,470,589
	7,146,873	9,116,196
1916 increase		1,969,323

	To Nov. 1, 1915.	To Nov. 1, 1916.
Escanaba	4,940,081	6,507,482
Marquette	2,836,203	3,546,651
Ashland	4,695,752	7,269,846
Superior	7,348,916	11,493,831
Duluth	14,108,571	19,472,473
Two Harbors	7,886,916	9,642,563
	41,816,439	57,932,846
1916 increase		16,116,407

Ore receipts at Lake Erie ports in October were:

Port.	October, 1916.	October, 1915.
*Buffalo	984,208	862,398
Erie	285,111	137,481
Conneaut	1,150,023	1,150,744
Ashtabula	1,488,120	1,187,847
Fairport	298,970	270,227
Cleveland	1,394,605	1,246,899
Lorain	702,105	429,115
Huron	193,206	108,632
Toledo	320,094	251,397
Detroit	48,203	96,436
Total	6,864,645	5,741,176

*Includes Port Colborne.

Bessemer Ore Sale

Philadelphia, Nov. 7.—A sale of 10,000 tons of Mesabi bessemer ore for this year's delivery has been made to an eastern Pennsylvania consumer at $5.25 at lower lake ports. This is an advance of $1.05 over this year's schedule. These sellers are offering 30,000 tons additional, both Mesabi bessemer and non-bessemer, for this year. A vessel rate of $1.20 per ton has been quoted for the carriage of this ore down the lakes.

The branch office of the Minneapolis Steel & Machinery Co., Minneapolis, Minn., now located at Helena, Mont., was moved to Great Falls, Mont., Nov. 1. W. A. Dodge is branch manager.

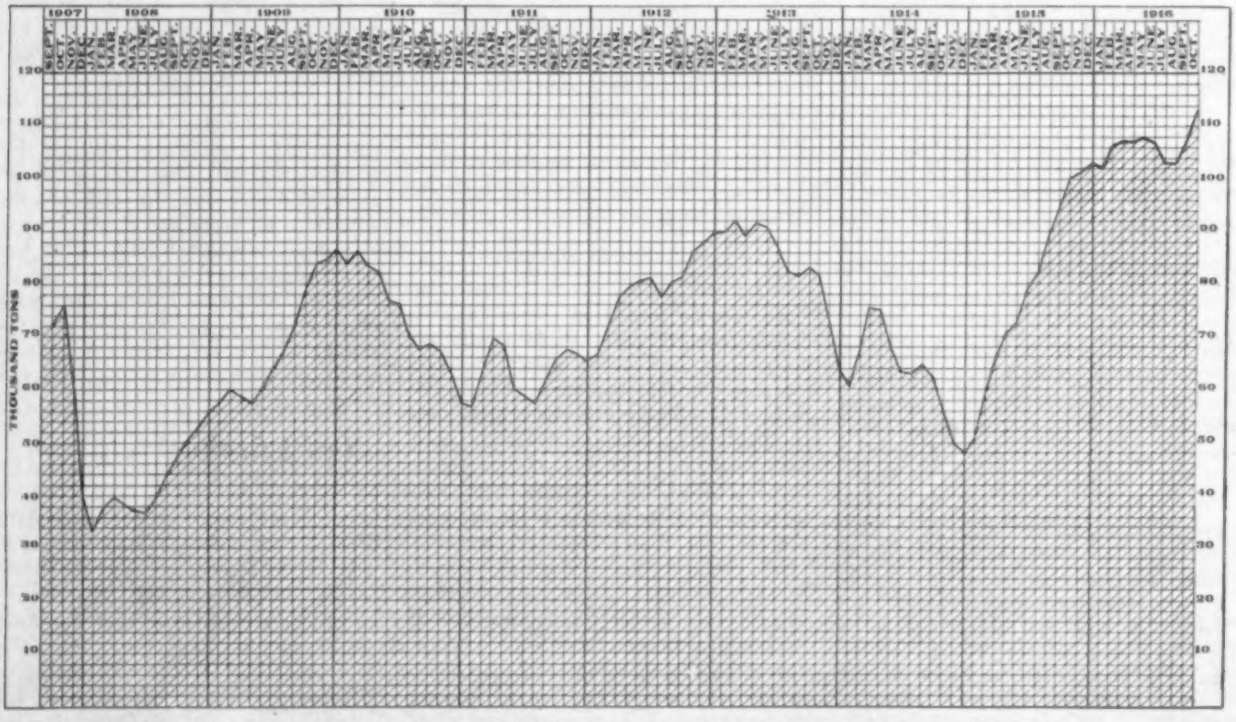
Billet Buyers

Are Trying to Contract for Delivery Last Half of 1917

Philadelphia, Nov. 6.—Some buyers of billets now are inquiring for contracts carrying deliveries beyond July 1, up to which date eastern makers have practically no tonnage to offer and the latter now are quoting higher prices for such accommodation. Rerolling billets for third quarter are placed at $55, eastern Pennsylvania mill, and forging billets at $70 to $75, mill. These prices also would probably apply on small lots before July, which is all the eastern works now can sell. There is more demand for semi-finished material generally in the market than there is supply for sale. Offerings of shell steel discards are of liberal tonnage with ruling prices from $30 to $35, mill.

Semi-Finished Higher

Pittsburgh, Nov. 7.—Although leading makers have not opened books for delivery after Dec. 31, a consumer is reported to have purchased about 4,000 tons of sheet bars for first quarter delivery, at a shade less than $54, mill. The market for both billets and sheet bars is quotable at a range from $50 to $55, mill. Scarcely any tonnage is available for delivery this year. Many consumers seriously are handicapped on account of inability to obtain tonnages, and some plants have been forced to suspend operations temporarily.



AVERAGE DAILY PRODUCTION OF COKE AND ANTHRACITE PIG IRON

(For complete prices see page 974.)

Pig Iron Production at High Mark

October Output Exceeds All Previous Records and Is at the Rate of 41,000,000 Tons Annually—Number of Active Blast Furnaces Continues to Climb

THE coke and anthracite blast furnaces of the country set a wonderful record during October in the production of pig iron. They produced 3,509,180 tons, a total which if maintained for a year would result in an output of 41,000,000 tons. The October total exceeded May, 1915, the best previous month on record by 145,000 tons. The prediction made last month that more favorable weather conditions in October would result in a wonderful production, has been fully borne out.

AVERAGE DAILY PRODUCTION.

	1916.	1915.	1914.	1913.	1912.
Jan.	102,319	51,323	60,624	89,929	66,220
Feb.	106,157	59,521	67,450	92,095	72,372
Mar.	107,343	66,009	75,534	89,123	77,791
Apr.	107,517	70,484	75,383	91,812	79,254
May	108,535	72,747	67,646	90,865	80,753
June	107,127	78,998	63,486	87,229	81,125
July	103,907	82,687	63,075	82,525	77,502
Aug.	103,156	89,510	64,403	81,839	80,650
Sept.	106,935	94,478	62,757	83,137	81,482
Oct.	113,199	100,656	57,007	81,933	86,569
Nov.	.....	101,174	50,042	74,322	87,985
Dec.	.....	103,278	48,236	63,746	89,590
Av'r'ge	106,617	81,022	62,934	83,980	80,124

The output last month exceeded that of September by 301,139 tons. The gain is shown more strikingly by a comparison of the daily average. In October the furnaces averaged daily 113,199 tons, against 106,935 tons in September, a gain of 6,264 tons.

The non-merchant or steel works furnaces produced 2,562,197 tons in October, a gain of 219,008 tons over September, in which month these furnaces produced 2,343,189 tons. The merchant furnaces also made a large gain in October, the production being 904,769 tons, compared with 827,166 tons in September, a gain of 77,603 tons. The average daily production of steel works furnaces showed a gain of 4,545 tons in October, the daily output being 82,651 tons, compared with 78,106 tons in September. Merchant furnaces in October gained 1,614 tons daily, the daily average being 29,186 tons in October, compared with 27,572 tons in September.

There was a net gain of two in active stacks in October, there being 328 in blast Oct. 31 compared with 326 on the last day of September. While seven merchant furnaces were blown in, six were blown out. Two steel works furnaces were blown in and one blown out.

The October ferro output amounted to 29,604 tons, a gain of 4,445 tons over September, when 25,159 tons were produced. There was a slight decrease in the daily rate of spiegel production, as October with 31 days shows a gain of only 83 tons over September, a 30-day month. The spiegel output was 12,610 tons in October and 12,527 tons in September.

The following merchant furnaces were blown in last month: One City, Sloss-Sheffield Steel & Iron Co., Oct. 6; one Woodward, Woodward Iron Co.; Ashland No. 1, Ashland Iron & Mining Co., Oct. 16; Palmerton No. 2, New Jersey Zinc Co., Oct. 6; Lebanon No. 3, Bethlehem Steel Co., Oct. 22; Napier, Napier Iron Works, Oct. 8; and Helen, Red River Furnace Co. Those blown out were: Bessemer No. 4, Tennessee Coal, Iron & Railroad Co., Oct. 8; Iroquois, Miami Products Co., Oct. 27; Bessie, Bessie Furnace Co.; Dover, M. A. Hanna & Co., Oct. 1; Shenango No. 4, Shenango Furnace Co., Oct. 19; and Max Meadows, Virginia Iron, Coal & Coke Co., Oct. 25.

MONTHLY PRODUCTION.

	1916.	1915.	1914.
January	3,171,878	1,591,024	1,879,336
February	3,078,548	1,666,592	1,888,607
March	3,327,630	2,046,280	2,341,551
April	3,225,496	2,114,518	2,261,501
May	3,364,584	2,255,157	2,097,019
June	3,213,818	2,369,932	1,904,566
Total 1st half.	19,381,954	12,043,503	12,372,580
July	3,221,127	2,563,311	1,955,324
August	3,197,838	2,774,825	1,996,483
September	3,208,041	2,834,342	1,882,718
October	3,509,180	3,120,340	1,767,227
Total 10 mos.	32,518,140	23,336,321	19,974,332
November	.....	3,035,235	1,501,269
December	.....	3,201,605	1,495,325
Total 2d half.	.....	17,529,658	10,598,346
Grand total.	32,518,140	29,573,161	22,970,926

The steel works furnaces blown in were: South Works No. 2, Illinois Steel Co., Oct. 1, and Emma, American Steel & Wire Co. Cambria No. 8, Cambria Steel Co., was blown out.

OCTOBER PIG IRON

States.	No. of stacks.	No. in blast last day of month. Oct.	Sept.	Total tonnage made. Merchant.	Non-Merchant	——Totals—— Oct.	Sept.
Pennsylvania	154	133	133	268,273	1,192,798	1,461,071	1,327,469
Ohio	75	66	67	195,310	569,449	764,759	703,590
Alabama	45	29	28	152,908	93,919	246,827	217,899
Virginia	22	8	9	31,762	.....	31,762	33,803
New York	26	20	20	75,858	119,539	195,397	185,843
New Jersey	6	1	1	7,431	.....	7,431	6,907
Illinois	24	23	23	54,660	287,528	342,188	313,256
Colorado	6	4	4				
Indiana	10	10	10	28,238	241,828	270,066	252,086
Maryland	4	4	4				
Wisconsin	6	4	4				
Kentucky	7	4	3				
West Virginia	4	4	4	51,121	30,404	81,525	71,407
Tennessee	17	11	9				
Washington	1	0	0				
Georgia	2	0	0				
Texas	3	0	0				
Minnesota	3	3	3	39,208	26,732	65,940	58,095
Michigan	3	3	3				
Missouri	1	1	1				
Spiegel—All states...						12,610	12,527
Ferro—All states....						29,604	25,159
Totals	419	328	326	904,769	2,562,197	3,509,180	3,208,041

Will Handle Reinforcing Bars

The Republic Structural Iron Works Co., Cleveland, has taken over the entire plant of the Avery Stamping Co., at Fifty-third and Lakeside, Cleveland, covering 100,000 square feet.

On this site, following extensions, alterations and rebuilding, will be installed a complete plant for fabricating and shipping bars for concrete reinforcing. Of special value to the contractors, are the storage facilities developed.

New Purchasing Agent

David P. Ballard has been appointed purchasing agent of the Wellman-Seaver-Morgan Co., Cleveland, to succeed Norman S. Thrasher, who has accepted the position of purchasing agent of the Western Dry Dock & Ship Building Co., Port Arthur, Ont. Mr. Ballard has been with the Wellman-Seaver-Morgan Co. for 11 years. Mr. Thrasher was formerly purchasing agent of the American Ship Building Co., Cleveland.

Heavy Buying of Cars

Orders for 12,000 Placed Last Week—New Russian Loan Will Finance Recent Orders and Other Large Purchases

New York, Nov. 7.—Heavy buying of cars by the railroads goes forward without diminution; in fact, has been heavier the past week than during any similar period. Orders for about 12,000 cars were placed within the week. The New York Central lines have been the heaviest buyer, closing for 4,000 box cars additional, of which 2,500 went to the American Car & Foundry Co, 1,250 to the Barney & Smith Car Co. and 750 to the Ralston Steel Car Co., as well as 250 passenger types additional, of which 125 baggage went to the American Car & Foundry Co.; 75 passenger to the Standard Steel Car Co and 25 passenger to the Barney & Smith Car Co. Inquiries still are pending for 125 baggage cars. These orders bring the total car awards of the New York Central system during the past six to eight weeks to over 10,000. The Union Pacific ordered 1,500 box of the American Car & Foundry Co. and 1,000 automobile of the Ralston Steel Car Co. The Philadelphia & Reading distributed 2,000 gondolas among four builders. The Burlington ordered 1,000 automobile from the Western Steel Car & Foundry Co. The Southern railroad order reported last week, it is now announced, calls for 1,313 gondolas to the Pressed Steel Car Co. The Wabash has been a buyer of 1,000 cars. A report that the Michigan Central has closed for a large order with the Pressed Steel Car Co. is incorrect. Present prices on cars are around $1,800 apiece, as compared with $800 to $1,000 before the war.

A new Russian loan for $50,000,000 now in the process of arrangement, is expected to include the financing of recent orders for equipment placed in this country and also to provide funds for additional large purchases of cars which have been under negotiation for several months.

Railmakers are going more slowly in booking orders for 1918 delivery, and some of the mills have not opened their books for that period. The best they will do for those roads which now are inquiring is to reserve a mill position, subject to the fixing later of the price.

Although there have been various reports that some mills were disposed to extend the present prices of $33 and $35, mill, to 1918 delivery, the latest indications are that this quotation still is unsettled. It is not unlikely that ultimately a further advance will prevail. Small lots of rails, principally for export, are being sold at $40 to $50, mill.

Another contract for 40 consolidation type locomotives has been received by the American Locomotive Co. from the Italian State Railways. The same builder also has taken 10 from the El Paso & Southwestern, five from the Western Pacific, four from Coates & Tweed, and one each from the Minnesota Steel Co. and from the Texas, Oklahoma & Eastern.

Mill Seeking Rails

Chicago, Nov. 7.—Inquiry is being entertained by the western rail mill for small tonnages of rails from a number of roads for delivery during 1917. These consist of lots of 5,000 to 8,000 tons, and the aggregate tonnage is not large. Some of this business can be taken and delivery made during the last quarter of 1917.

No further sales for 1918 delivery of rails have been made, and it is understood no more of this business will be taken at the present. The reason advanced for this change is that the delivery is too far removed from the present and that material has never been sold so far ahead in the past. From other sources come indications that the price of rails possibly is not a determined matter, and that a further advance may be made on this class of steel for 1918. Apparently nothing definite along this line has been done, but with rails selling at $35, mill, for open hearth, while other forms of steel will net the mill practically double this figure, it would not be surprising if some change in price might be made.

West Sells Many Cars

Chicago, Nov. 7.—Sales of freight cars in the west during the past week total well over 10,000, and inquiry is now active on probably 10,000 additional, most of which probably will be placed. This heavy selling indicates that fully 100,000 tons of steel were placed last week for this one purpose, and this appears to have been the most important feature in the steel market.

Sales already closed include the following: Morris & Co., 450 refrigerator cars to the Haskell & Barker Co.; Duluth, South Shore & Atlantic railroad, 500 box cars, the Haskell & Barker Car Co.; Union Pacific railroad, 1,500 box cars, Illinois Central, 400 ballast cars, and Chicago & North-Western railroad, 1,500 box cars, all to the American Car & Foundry Co.; Morris & Co., 500 refrigerator cars, to the Bettendorf Co.; Illinois Central, 1,000 gondolas, and New York Central, 1,000 box cars, to the Standard Steel Car Co. In addition to these, the Western Steel Car Co. is said to have taken an order for 3,000 cars, the buyer of which is not disclosed.

Present inquiry includes 500 box cars for the Atlantic Coast Line, 300 ore cars for the Northern Pacific railroad, 2,000 hoppers for the Chesapeake & Ohio railroad, 600 gondolas for the Illinois Central, 1,000 box cars for the Pere Marquette, and 4,000 box cars for the Chicago, Burlington & Quincy railroad.

Cambria Gets Cars

Philadelphia, Nov. 6.—Orders for 2,000 hopper cars have been taken by the Cambria Steel Co., of which 1,000 are for the Philadelphia & Reading and 1,000 for the Cambria & Indiana roads. The Atlantic Coast Line is out for 15 locomotives. The Norfolk & Western wants 8,000 kegs of spikes for first half.

Pipe Prices

Are Established Without Trouble—Some Quote Higher

Pittsburgh, Nov. 7.—Advanced prices of iron and steel pipe, which went into effect Nov. 1, have been established without difficulty. Some mills, in fact, now are quoting from $1 to $4 a ton above the generally prevailing prices. Consumers do not appear to hesitate about offering premiums for reasonably prompt delivery. Some of the larger mills are unable to promise lap welded pipe for shipment in less than six months. Premium prices frequently are paid for boiler tubes and seamless tubing, deliveries of which are deferred from six to ten months.

Proposed Ohio Merger

Following an all-day conference in New York, Saturday, relative to the proposed merger of the American Rolling Mill Co. and the Columbus Iron & Steel Co., President George M. Verity, of the former company, made the following statement:

"A definite agreement has been reached between the American Rolling Mill Co. and the Columbus Iron & Steel Co. in regard to the merger of the two properties. A definite plan of reorganization has not yet been worked out, but substantial progress has been made."

(*For complete prices see page* 974.)

Obituaries

Samuel S. Fair Sr. died at his home in Saginaw, Mich., Oct. 23, aged 70 years. Mr. Fair was born in Bailboro, Ont., Jan. 20, 1846, and grew to manhood there, learning the wagonmakers' and molders' trades. He established a wagon factory and a foundry at Blaine, Mich., in 1878, and nine years later moved to Bay City, where he established the Bay City Plow Works. He remained in active management of that concern until 1897, when he sold his interests and moved to Saginaw, where he established the firm of S. Fair & Son, engaging in the manufacture of plows. He afterward established a successful business in the making of gray iron castings, while in later years the company has been a manufacturer of crucible and electric steel castings. A few years ago, the company was changed from a partnership of Mr. Fair and his son, Louis G., to a stock company and it will continue under the management of Louis G. Fair.

John W. Kiser, president of the Phoenix Horseshoe Co., died Tuesday, Nov. 1, at the Blackstone hotel, in Chicago, after a severe illness extending over the past year. He was 58 years old and is said to have possessed a fortune of about $8,000,000. In addition to being president of the Phoenix Horseshoe Co., he was a director of the First National Bank in Chicago and of the Miehle Printing Press Co. His first successful venture in business in Chicago was with the Monarch Bicycle Mfg. Co. at the time of the greatest popularity of that vehicle. He sold his interest in this business and became connected with the Phoenix Co., which had a plant at Poughkeepsie, N. Y., and later built a second plant at Joliet, Ill. It is capitalized at three million dollars, and Mr. Kiser held practically all the stock. He will be succeeded in his business by his son, John W. Kiser Jr., who has had some experience in the business.

B. F. Shaw, general superintendent of the American Brake Shoe & Foundry Co., died Oct. 27 at his home in Suffern, N. Y.

Joseph W. Ogden, director of the American Can Co. and other corporations and prominent as a financier, died at the Metropolitan club, New York, Oct. 26, from a sudden illness.

William Cooper Cuntz, managing director of the Goldschmidt Thermit Co., 120 Broadway, New York, died Nov. 2 at Auburndale, Mass., aged 45 years. He was born and educated in Hoboken, N. J., and first took employment with the Pennsylvania Steel Co. at Steelton, Pa. Later he represented this company in Boston, Philadelphia and London. His connection with the Goldschmidt Thermit Co. dates from 1910. He was a member of the American Iron and Steel Institute, American Society of Civil Engineers, Engineers' Club of New York and other organizations.

Edwin M. Wilkes, owner of the Wilkes Machine Works, Trenton, N. J., was instantly killed recently while testing a stuffing machine in a provision plant here. He was using 500 pounds of air when a 200-pound piston blew out and struck him.

Theodore N. Ely, a former director of the Cambria Steel Co. and of the Pennsylvania Steel Co., died at Bryn Mawr, Pa., Oct. 28. He was a prominent engineer and was chief of motive power of the Pennsylvania railroad from 1893 to 1910.

Frederick Davidson, former secretary and treasurer of the Union Drawn Steel Co., president and director of the Beaver Clay Mfg. Co., and an officer and director in many smaller concerns, died last month of heart failure while bathing in the surf at Atlantic City.

Charles W. Hotchkiss, president of the Rail Joint Co. and prior to that a prominent railroad man, died at Battle Creek, Mich., Oct. 29, of heart disease, aged 53 years. He was a pioneer in the development of the Calumet industrial district near Chicago.

Edwin F. Goodison, president of the John Goodison Threshing Machine Co., of Sarnia, Ont., died suddenly on a Grand Trunk railway train between Hamilton and Toronto on Oct. 29. He was 44 years of age and succeeded his father as president of the company 18 months ago.

Henry Provance Snyder, 60 years old, editor of *The Connellsville Courier*, Connellsville, Pa., died unexpectedly at his home in that city, Oct. 27. Mr. Snyder was well known in the iron and steel industry, and was regarded as an authority in the coke trade. For many years *The Connellsville Courier* each week has published figures showing the production and shipment of coke in the Connellsville regions of western Pennsylvania.

Henry Potts, head of Henry Potts & Co., Real Estate Trust building, Philadelphia, and a well known iron and steel merchant, died at his home in Pottstown, Pa., several days ago from an attack of pneumonia. He was a member of the Potts family, which has been prominently identified with the iron and steel industry of eastern Pennsylvania and from which Pottstown received its name.

National Founders

Will Hold Twentieth Annual Convention in New York

The National Founders' Association will hold its twentieth annual convention at the Hotel Astor, New York City, Nov. 15 and 16. Wednesday morning and afternoon and Thursday morning will be given over to business sessions. The administrative council will hold its executive meeting Tuesday morning at 10 o'clock. The alumni dinner will be held Tuesday evening at 6:30 o'clock, and the annual convention banquet Wednesday evening at 7 o'clock. The toastmaster at the annual banquet will be William H. Barr, of Buffalo, president of the association. Two addresses will be given at this banquet: Industrial Co-Operation, by Frederick C. Fish, of Boston, and The Story of San Francisco, by James A. Emery, of Washington.

At the Wednesday morning session, after roll call and reading of minutes, reports of officers will be made by President W. H. Barr, Commissioner A. E. McClintock, and Secretary J. M. Taylor. George F. Monaghan, general counsel of the association, will speak on Industrial Legislation. A report will be made by A. F. Corbin, of New Britain, Conn., chairman of the committee on safety and sanitation, and by J. J. Wilson, of Detroit, chairman of the committee on foundry methods.

Wednesday afternoon will be devoted to four half-hour addresses. M. W. Alexander, of West Lynn, will speak on The National Industrial Conference Board; E. W. Rice Jr., president of the General Electric Co., Schenectady, N. Y., on How Shall Manufacturers Contribute to American Industrial Progress?; Frank A. Vanderlip, president of the National City Bank, New York City, will speak on The Banker's Relation to Industry, and Ely Griswold, of the Griswold Mfg. Co., Erie, Pa., will be heard on A Proposal for Increasing Effectiveness of The National Founders' Association.

Thursday morning, Edward Kneeland, of the United Engineering & Foundry Co., Pittsburgh, will speak on The Pittsburgh Strike Situation. Edward K. Nicholson, counsel for the Bridgeport Manufacturers' Association, will be heard on The Responsibility of the Individual Employe. W. H. Vandervoort, president of the National Metals Trades Association, will present a report of the joint conference board on apprentices. The reports of the resolutions and finance committees and the election of officers will close the session.

Coke Shortage

Responsible For High Prices—Heavy Inquiry Pending

Pittsburgh, Nov. 7.—The shortage and high price of fuel have combined to complicate the situation. Bituminous coal for prompt delivery is commanding from $5 to $5.50 a ton at the mine, as against $1 a ton several months ago. Furnace coke for immediate shipment again has sold at $8, ovens, although still available at $7.50, ovens. Several prominent eastern blast furnace interests have been figuring in the market this week. A number of inquiries are pending for shipment all of next year. The contract market appears to be stronger than it was a week ago, when one block of 120,000 tons was sold for 1917 delivery at $3.75, ovens.

The observance of All Saints' Day last week tended to reduce production of coke in the Connellsville regions and cause prices to swing upward about 50 cents a ton for immediate shipment. Seventy-two hour coke is being held at $8.50, ovens, by some interests. *The Connellsville Courier* for the week ending Oct. 28 says production was 430,331 tons, compared with 398,096 tons the week before.

Wild at Cincinnati

Cincinnati, Nov. 6.—The coke market is about as wild and uncertain as is possible for it to be. The only quotations for southern makes are for spot coke, and these vary over a wide range. One Wise county interest is asking $8, ovens, for prompt delivery. Very little coke is available for contract delivery, because operators are finding it more profitable to sell coke at present prices than to turn it into coke. The car shortage is very acute, and shipments are being seriously handicapped. A large number of melters who have covered for yearly requirements are being forced to buy spot lots from time to time, because of the inability of the railroads to get shipments to them.

Coal Land Purchase

Philadelphia, Nov. 7.—A tract of 5,200 acres of coking coal land near Marianna, Pa., has been purchased by the Midvale Steel & Ordnance Co. from the Union Coal & Coke Co. at a reported consideration of several millions. This land is intended to increase the coking coal reserves of the company to a point required by its extending operations.

Coal Lands Sold

Birmingham, Ala., Nov. 6.—The Alabama Co. closed during the week a sale of 7,000 acres of its coal lands to the Semet-Solvay Co. These lands have been systematically diamond-drilled for the past four months by the Solvay people, who have disclosed between 20,000,000 and 25,000,000 tons of as high-grade coking coal as exists in the Birmingham district. The consideration paid for these lands was $500,000. In addition to the drilling on these coal lands, the company has been busily engaged in the drilling of red ore lands in the neighborhood of Shades Valley, below the self-fluxing ore lands recently acquired by the Gulf States Steel Co. There is no information available as to the ultimate intention of the Semet-Solvay Co. in its acquisition of the coal lands, except that the coal will be available for use at either its Holt or Ensley by-product coke plant.

By-Product Scarce

St. Louis, Nov. 6.—By-product coke is scarce, and hard to get. Foundry grades are quoted at $12, f. o. b., St. Louis, and furnace grades at $11 a ton. Inquiries are pouring in and many of them are being turned down. Inquiries are coming even from Chicago for by-product coke. Connellsville foundry coke is held at $8 to $8.50 a ton; Virginia, at $7.50 to $8.

New Plant for Canal Dover.—The Cleveland Steel Valve Co., Cleveland, has taken an option on the Skelly Mfg. Co. plant in Canal Dover, O. The valve company holds a year lease with an option of purchase. Gate, globe and angle valves for heavy work, pipe fittings and kindred articles are being manufactured. The company has already occupied the new plant.

Prices Hold

While Results of Election are Calmly Awaited

Pittsburgh, Nov. 8. (By wire.)—With the result of the election still in doubt, the general iron trade temporarily halted this morning and is calmly awaiting developments. Prices of all products appear to be holding their own. Basic pig iron is being held at $24 and it is predicted that the market will be established at that figure before the end of the week.

The Louisville & Nashville railroad is reported to have placed orders for 5,000 gondola cars.

The Valley Mold & Iron Co., Sharpsville, Pa., in October shipped 28,855 tons of ingot molds, breaking all previous records.

Sidney Dillon, mechanical engineer, Edgar Thomson works of the Carnegie Steel Co., has been appointed chief mechanical engineer to succeed John Hulst, who recently was called to New York to occupy a somewhat similar position with the United States Steel Corporation. Mr. Dillon has been with the Carnegie company ever since he was a boy.

The Non-Ferrous Metals

Copper **Lead** **Spelter** **Tin**

New York, Nov. 6.—Current developments in the metal markets are confined largely to copper. The continued active demand for this metal is having a more pronounced bearing on prices due to the fact that the deliveries available rapidly are moving farther away into the future. In electrolytic copper, at least 95 per cent of the output over the next five months has been sold while bookings for the second quarter of next year appear to involve 50 to 60 per cent of the production over that period. Last week was featured by some good-sized foreign orders but the bulk of the current business is from domestic brass mills. Electrolytic copper now is quoted as follows: November and December, 30c to 30.25c, cash; first quarter, 29c to 29.25c, delivered 30 days; second quarter, 28c to 28.25c, delivered 30 days. Medium grades of lake copper are quoted at 30c to 30.25c, delivered 30 days, for November and December shipment, while first quarter is quoted at 28.75c to 29c, delivered 30 days. Ordinary casting copper is quoted at 28.25c to 28.50c, cash, for November shipment and 28c, cash, for December and January.

Demand for spelter, while not active, continues to develop at a satisfactory rate, both from galvanizers and from the brass mills. Prime western now is quoted as follows: Prompt, 10.62½c, St. Louis, November, 10.50c to 10.62½c; December, 10.50c; and first quarter, 10.37½c. Brass special spelter is quoted at 11.25c, St. Louis, for prompt shipment.

Stocks of tin in this market do not show any prospects of being increased during the next six weeks and it is likely that they will be further reduced, owing to the difficulty in obtaining licenses for exporting the metal from the Straits and from Great Britain. The market for spot, November and December is quoted at 42.50c, while future months shade off about ¼c for each position.

The lead market is dull and featureless but is strong statistically. The outside market is quoted at 6.87½c to 6.90c, St. Louis, and 7c to 7.05c, New York. The American Smelting & Refining Co. continues to quote 7c, New York.

The outside aluminum market is quiet with quotations as follows: No. 1 virgin ingots for prompt and nearby shipment in carload lots, 63c to 64c; No. 1 remelted, 58c to 60c; No. 12 alloy, 47c to 48c.

The antimony market continues to drag along without any important developments. Spot delivery is quoted at 13c, duty paid, and November and December shipment from the far east at 11.50c, in bond.

(*For complete prices see page 974.*)

Segregated Streaks in Steel Rails

These Streaks Were Found in 114 Out of 119 Rails Tested—The Causes of the Formation of Such Flaws Are Discussed and a Remedy Suggested

BY GEORGE F. COMSTOCK

IN THE investigation of rail failures by government engineers and others, considerable stress is often laid on the microscopic examination of sections of the rails by means of etching treatments. Various acids, idoine, ammonium-copper chloride, etc., are used for etching the sections, and while some rails do not show any markings when so etched, others often show very distinct dark spots and lines on a lighter background. All investigators agree that these markings constitute a defect in the steel, and indicate a heterogeneous composition or structure, but some reports and papers show that the authors do not have a very clear idea as to what these markings really represent, and what their immediate and primary causes are. "Streaks" and "laminations" are some of the more or less hazy names applied to them, and although descriptive to a certain extent, they seem to need a further explanation. Many rails have been examined macroscopically and microscopically in this laboratory in the natural course of several years' work (in comparing ordinary with titanium-treated rails), and very nearly all of the ordinary (untreated) A-rails examined have been found to show streaks on etched sections or sulphur prints. Many of these streaked rails have been etched in different ways, and the markings shown by the different reagents have always been similar in general plan for any given rail. The intensity and clearness of definition of the markings, however, varies with the reagents used. Possibly it would be worth while to state briefly the characteristic action of each reagent as it has been noticed in this laboratory.

A report to the rail committee of the American Railway Engineering Association. The author, George F. Comstock, is associated with the Titanium Alloy Mfg. Co., Niagara Falls, N. Y., in the physical testing laboratory.

How Each Reagent Acts

Strong hydrochloric acid allowed to act for from half an hour to three hours is probably the easiest reagent to use, as the markings are deep and the section can be wiped dry after etching and washing without spoiling them. They are not, however, sharply defined. Strong nitric acid is likewise easy to use, and gives markings somewhat more sharply defined, but with less contrast, than those made by hydrochloric acid. Iodine gives a much neater pattern than either of these acids, but it is harder to use, as the section cannot be wiped dry after etching without marring it, and unless the drying with alcohol is rapidly done, the steel is very apt to become tarnished or rusty before it is dry, thus spoiling the result and necessitating repolishing. Iodine has been used by the writer both as a concentrated solution in alcohol and in a water solution with potassium iodine, sometimes one solution giving the best results, and sometimes the other. If there is a little water in the alcohol solution, the etching will be uneven and the results very misleading, so that the water-iodine solution is probably the safest. Both these solutions are apt to give a darker stain all around the edges of an etched section, and this tendency should be allowed for in drawing conclusions from an etching test, even when the drying has been done carefully enough to avoid the irregular tarnishing which takes place so easily. A double chloride of copper and an alkali metal has been used by some workers for etching steel, but not by the writer with any success. As the chlorine is the effective element in this solution, its mode of action must be similar to that of hydrochloric acid at least in regard to which particular spots of a section are darkened.

The writer has found that the quickest, surest and neatest way of getting a picture of the "streaks" in a section of metal is by means of a sulphur print. The method of making these prints is well known, but it perhaps should be briefly described here. The section need be only roughly polished with coarse emery cloth, but it must be clean and cold. A piece of almost any kind

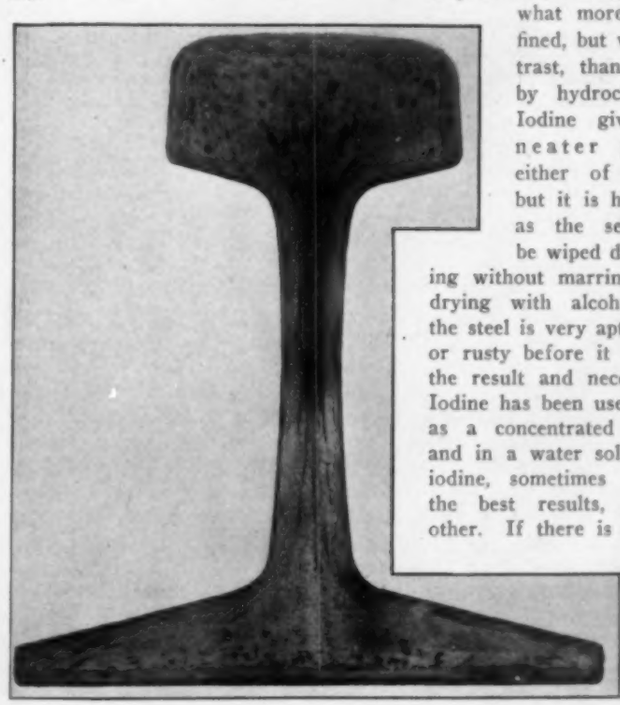


FIG. 1—SECTION OF OPEN-HEARTH A—RAIL "X"
Etched with iodine.

FIG. 2—SECTION OF BESSEMER A—RAIL "Y"
Etched with hydrochloric acid.

of photographic "developing-out" paper is moistened thoroughly with 3 per cent sulphuric acid, and placed on the section of steel carefully so that good contact is made at all points and without the slightest lateral movement of the paper over the steel. Contact should be maintained for about a minute, to allow the acid to act on the sulphides in the steel, liberating hydrogen sulphide which acts on the silver in the photographic paper, causing a dark spot above each sulphide inclusion. The print thus made should be fixed and washed like a photograph and will then be a permanent record of the location of the sulphides in the steel section. A second, and even a third and fourth print sometimes can be made from the same section without repolishing by giving longer periods of contact each time, and the second and third prints are always more sharply defined than the first. After a little practice in securing perfect contact without movement between paper and steel, these prints can be made practically perfect, so that no retouching whatever is necessary on them. The spots formed on the paper by the hydrogen sulphide bubbles are larger than the microscopic inclusions from which the gas is evolved, so that if the inclusions are close together the spots produced will merge into each other and form a large dark spot or streak. But in spite of this a well-made sulphur print is as sharply defined as a good photograph of an etched section, and is much less trouble to make, besides being more certainly free from misleading indications.

The above explanation of the manner of formation of a sulphur print shows that it is the sulphide inclusions only that make the dark spots in this case. It is literally true, therefore, that such a print shows the segregation of the sulphur. But in every case met in the writer's experience of several years with this subject, segregated groups of sulphide inclusions were invariably found to be surrounded by metal at least slightly higher in carbon than the average for the rail. Where broad streaks full of sulphides are present in the web of a rail, chemical analysis, as well as the microscope, always shows higher carbon and phosphorus with the higher sulphur. Where small spots of abundant sulphides are found around the edges of a rail's cross-section (when seen longitudinally, these of course would also be streaks, known sometimes as "ghost lines") the area of an individual spot may often be too small for a chemical analysis to be made of just the spot and hence higher carbon may not be shown in this way. The microscope, however, will always according to the writer's experience, show higher carbon metal around the spot even though the individual sulphide inclusions may be embedded in ferrite on account of segregation of phosphorus.

One of the specifications of the American Society for Testing Materials states that etching with iodine "shows up the segregation of carbon," while etching with acids shows up the segregation of manganese sulphide, slag, etc. The question of slag will be considered later, and while it may be theoretically true that some reagents attack high-carbon areas and others attack the sulphides, this seems a rather useless distinction since experience has shown that high carbon and high sulphur are always more or less associated with each other in the segregated streaks of rail steel. Furthermore phosphorus undoubtedly has a marked effect in causing the dark marks shown by etching, for in microscopic work high-phosphorus areas always etch darker and quicker than more normal metal. Hence it is more reasonable to conclude that microscopic etching of any kind shows the general segregation of carbon, phosphorus and sulphur, and that the various reagents used differ more in the distinctness with which they show the same segregation than in the different kinds of segregation shown.

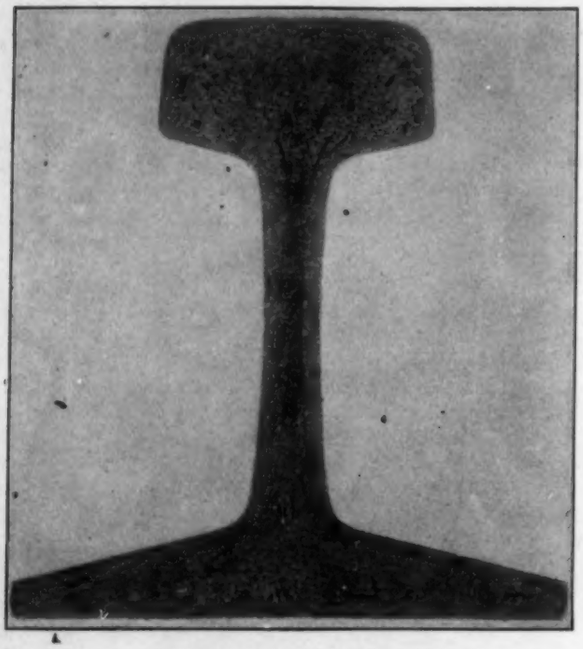


FIG. 3—SULPHUR PRINT OF RAIL "X"

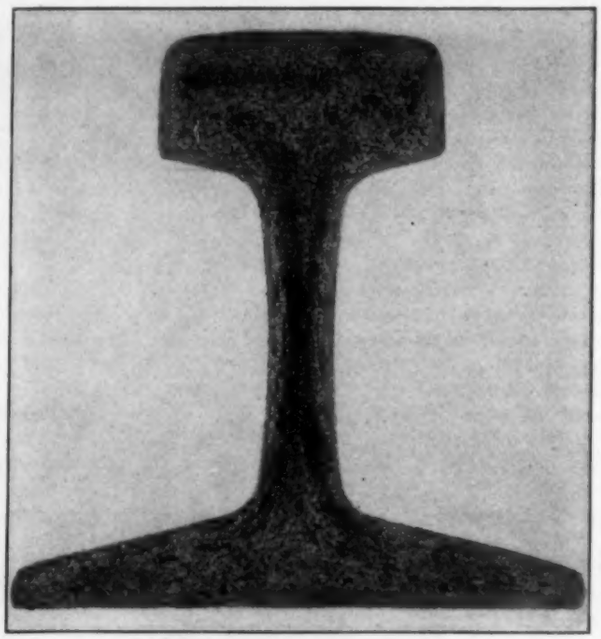


FIG. 4—SULPHUR PRINT OF RAIL "Y"

Sulphur prints and iodine etchings from some rails that are not segregated show lighter streaks, roughly symmetrical in outline with the shape of the section, on a darker background. These light streaks have always been found to be lower in carbon than the surrounding metal, but do not seem to be always lower in sulphur. The fact that these marks show on a sulphur print and yet are not caused by sulphur may seem to contradict what has been stated above, but this is not necessarily so. Sulphur prints show segregation of sulphides by *dark* spots on a lighter background. The darkness of the background itself depends primarily on the duration of the etching action, but also seems to be governed in some way, on a sulphur print as well as with other etchings, by the carbon content of the steel. Hence low-carbon streaks show

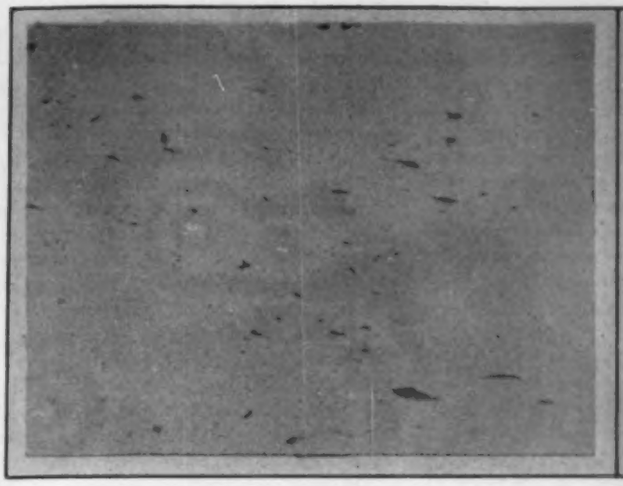


FIG. 5—ONE OF THE SEGREGATED SPOTS IN HEAD OF RAIL "X"

Unetched, showing numerous sulphide inclusions. Magnified 200 diameters.

FIG. 6—PART OF A TYPICAL SEGREGATED STREAK IN WEB OF AN OPEN-HEARTH RAIL

Unetched and magnified 200 diameters, showing numerous sulphide inclusions.

up lighter than the rest of the background, as a rule. This question of light streaks on etched sections has been discussed, and a possible explanation of their cause has been proposed in rail report bulletin No. 3, if this association, from which the following two paragraphs are quoted.

"The most reasonable explanation for the occurrence of these streaks of lower carbon metal in the rails from tops of ingots is that the ingot was squeezed by the blooming mill before the upper part of its interior was entirely solid. In cooling from the liquid state in an ordinary metal mold, a steel ingot forms a solid shell rather quickly, before much segregation can take place. But the interior of this ingot cools very slowly, and the ingot is generally placed in the soaking pit before its interior has even reached its freezing temperature. Here its cooling is extremely slow, since the pit is kept at a high temperature, and the selective freezing which causes segregation is enabled to proceed. At some period before it is taken out and rolled, the ingot consists of the following zones or layers, counting from the outer surface inward: First, a very thin layer of metal from which the carbon has been burned out by the flame of the soaking pit, causing scale, and making the metal next to the scale of lower carbon than the ladle analysis; second, a zone of metal which although heated in the soaking pit was originally chilled by the iron mold soon after casting and before segregation took place, and which is, therefore, of about the same carbon as the ladle analysis; third a zone of metal which was not chilled completely solid before entering the soaking pit, and in which, therefore, segregation took place at least to a slight extent even if the steel was treated with titanium. Owing to the well-known selective freezing of steel, this zone must consist of crystals of metal lower in carbon than the ladle analysis, together with liquid metal which is higher in carbon, forming a soft 'mushy' mass in the interior of the ingot. The outer portions of this zone would consist chiefly of the lower-carbon crystals, and the nearer the center is approached the higher would be the proportion of high-carbon liquid until at the center there might be nothing but the liquid known as the segregate, and containing a large amount of the impurities of the steel. The above condition would be confined largely to the upper part of the ingot, as the central and lower parts cool faster and contribute whatever segregate they may form to the upper part.

"If an ingot with a 'mushy' interior, as described above, is taken out of the soaking pit and rolled, the pressure of the rolls will tend to expel all liquid material through the pipe end, or at

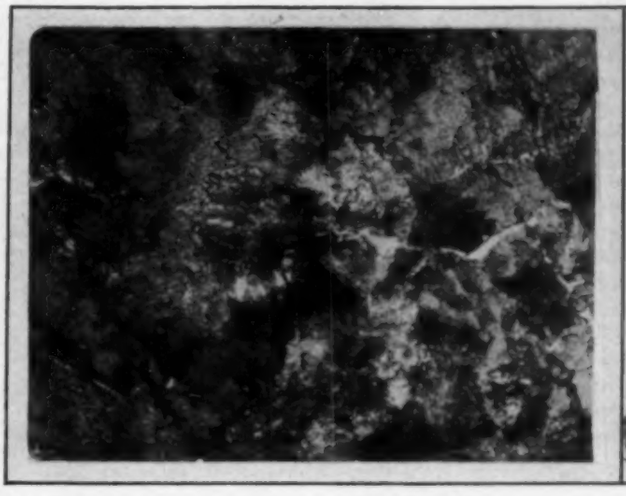


FIG. 7—AVERAGE VIEW OF HEAD OF RAIL "X"

Etched with picric acid and magnified 400 diameters, showing pearlite and sorbite, with a little ferrite and no cementite. (Compare with Fig. 8.)

FIG. 8—PART OF SAME SPOT SHOWN IN FIG. 5

But etched with picric acid and magnified 400 diameters, showing thin bands of cementite between pearlite grains.

FIG. 9—PART OF SEGREGATED STREAK IN WEB OF RAIL "X"

Etched with picric acid and magnified 100 diameters, showing sulphides and cementite in the steel.

least to push it forward into the pipe where it may chill before it runs out. At any rate it would be cut off with the crop end when the bloom is cut. There would then remain in the center of the upper part of the bloom only the crystals of lower-carbon metal which were solid at the time of rolling, surrounded by metal of about the ladle analysis which was chilled after casting before much segregation took place. It can readily be seen that under varying conditions of temperature and pressure between the rolls, the expulsion of the segregate would not always be complete even when the ingot's center was not solid, and different streaks of higher and lower carbon metal might be expected in most cases. Where segregation is excessive and the segregate extends far down in the ingot, it would not be expelled by rolling at the usual temperatures, and would be found at the center of the finished rail."

To say that microscopic etching shows up the distribution of slag inclusions in steel may be literally correct when acids are used, but the practical importance of this effect is small. If a certain slag inclusion contains sulphur, the etching reagent will attack and darken the metal around it just as if it were a sulphide inclusion, but if the slag does not contain sulphur the acid may attack it but will make such a very small pit that the effect will hardly be noticed in comparison with the strong effect produced around the sulphides. If the slag inclusion in question is largely oxide or scale, the surrounding metal is always decarbonized, and hence appears lighter than the rest of the section on a sulphur print or iodine etching. This is the case with the seams at the top of the head of a rail or at the bottom of the flange, for they are generally filled with scale; and the same effect is usually seen around a pipe at the center of the section. Thus macroscopic etching is of small value in "showing up" slag inclusions in rails, for unless they contain sulphur or are large enough to be seen without etching, they cannot be seen very well afterward. Its great value lies in indicating the extent and amount of segregation of carbon, phosphorus, and sulphides, which should not be confused with slag inclusions.

The writer would like to call attention, in passing, to the futility of attempting to draw conclusions as to the microstructure of a piece of steel from evidence presented by a macroscopic etching of a large surface. Such a case was presented and discussed before one of our leading technical societies a few years ago, the basis for the paper being a macroscopic etching of a billet that seemed to show a very coarse structure at its center. It did

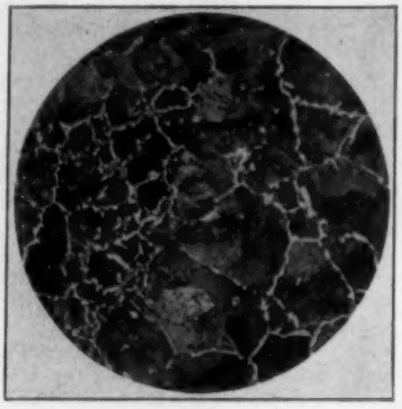


FIG. 10—ONE OF THE SEGREGATED SPOTS IN HEAD OF RAIL "Y"

Etched with picric acid and magnified 100 diameters. Sulphide inclusions can be seen embedded in ferrite, in a group of fine dark-etching pearlite grains. This spot, high in sulphur and phosphorus, is surrounded by metal with less ferrite (higher in carbon) than the average for the section.

not occur to any one of those participating in the discussion that the etching showed merely the arrangement of the sulphide inclusions in the interior of the section, and these followed roughly the outlines of the original crystals of the ingot. The crystalline or microstructure of this billet probably was entirely different from that shown by the etching, because the heating and rolling which it had undergone would materially change the metallic structure throughout without necessarily disturbing the distribution of the sulphides near the center of the section. As a photomicrograph would have shown the structure plainly and truly, it seemed unfortunate that one was not made before wrong conclusions were drawn from the macroscopic etching. The present writer has often noticed similar indications of very coarse crystals on sulphur prints from steel axles, when actually the microstructures of the axles were extremely fine.

The foregoing discussion of the effects of the various reagents and methods used in macroscopic etching has at the same time explained the nature of the spots or streaks which this etching develops. They are always composed of segregated sulphide inclusions which are probably always accompanied by segregation of carbon and phosphorus. No case has been found where serious sulphide segregation at the center of a rail section was not accompanied by similar segregation of the other two elements at the same point; and streaks of sulphide inclusions near the edges of a section are always accompanied by at least slightly higher-carbon and higher-phosphorus metal. That these segregated streaks are not uncommon in rail steel as made today is shown by the fact that out of 119 standard open-hearth A-rails made at various American steel mills and examined, only five could be said to be entirely free from them. Of the 114 streaked rails, many, of course, showed comparatively few and light markings; but many, on the other hand, showed streaks as numerous and as intense as any of the failed rails whose split heads have been attributed by various investigators to this cause. There is no reason to suppose that rails rolled according to the present practice of the steel mills will be any freer from split heads after a few years' service than those rolled in former years.

Having now explained the nature of the streaks shown in certain rails by macroscopic etching, a short discussion of their causes and results

FIG. 11 — EDGE OF A SEGREGATED STREAK IN WEB OF AN OPEN-HEARTH RAIL

Etched with picric acid and magnified 50 diameters. Only one half of photomicrograph shows a ferrite network; other half shows a higher-carbon streak.

may be of interest. In order that their importance may be better appreciated, the results will be considered first. The exact stresses to which a rail is subjected in service have never been determined, but it is unanimously admitted that a good rail should not only be hard enough to resist wear, but should also be sufficiently ductile so that it will not break under shock. Hardness is advantageous only at the outside of the head, where the wearing action of the wheels is applied. The rest of the rail need not be hard but should be strong, tough, and ductile enough to withstand considerable impact. But in order to secure enough hardness at the wearing surface, the whole rail has to be made of hard material, and consequently the carbon is kept as high in rail steel as it can be without imparting brittleness. The limit, above which the steel becomes brittle, is higher in basic open-hearth steel than in acid bessemer steel, because the latter necessarily contains more phosphorus than the former, and this also is a hardening element which when too high causes brittleness. Good, clean, open-hearth steel of negligible phosphorus content, is not too brittle to make a good rail unless the carbon content is above 0.85 or 0.90 per cent. When it is higher than this, a very hard brittle substance is present between the steel crystals, and the metal as a whole thus becomes brittle. This substance is iron carbide, known as cementite, and it is often found in segregated streaks in open-hearth rails. When the phosphorus is high, as in bessemer steel, the steel crystals are ordinarily coarser, and the steel is brittle if the carbon content gets as high as about 0.70 per cent, or unless there is a fairly thick network of soft ductile iron (ferrite) between the steel crystals. Thus it is evident that, since rails are usually made as hard as is possible with safety to resist wear, segregated streaks, in which the carbon and phosphorus are more abundant, are too hard and brittle for the service which a rail must stand. The brittleness of the streaks is very much intensified also by the sulphide inclusions always present in them, for the sulphides have practically no strength or ductility and directly weaken the metal by interrupting its continuity. The hardness of the streaks is of no value in resisting wear, as they are not present around the outside of the head, but at the center of the rail's section, where their hardness is not needed and their brittleness is dangerous.

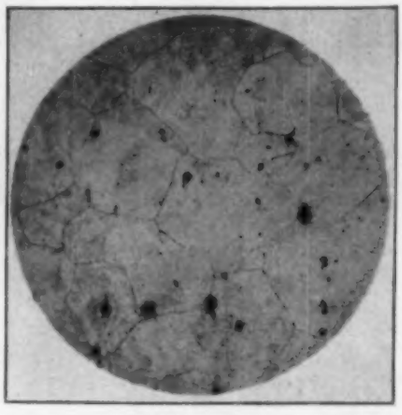


FIG. 12 — PART OF A SEGREGATED STREAK IN WEB OF AN OPEN-HEARTH RAIL

Etched with boiling alkaline sodium picrate, showing darkened cementite network and sulphides also attacked by the reagent.

Of course segregated streaks in a rail are surrounded and supported by normal fairly ductile metal, and it is very rare for a rail to break in a sudden brittle manner because of the presence of brittle streaks. Rail failures are nearly always slow and progressive, beginning with a very slight crack which grows with each subsequent stress. Wheel loads on every rail have a compressive action on the top of the head which makes the metal flow sidewise. There is also alternate bending between the ties. Hard stiff segregated streaks do not submit readily to these stresses, while the softer surrounding metal may be rather easily deflected. Internal strains are thus produced between the two kinds of metal, and a crack is the result, sooner or later. The brittleness of the segregated streaks assists the development of the crack, until it becomes large enough to destroy the rail. Split heads are practically always formed in this way, and all the rails that fail from this cause are found to contain segregated streaks.

FIG. 13—SEGREGATED SPOTS IN HEAD OF RAIL "X"

Magnified 200 diameters and etched with cupric chloride and hydrochloric acid. According to Stead, this reagent darkens normal steel, leaving high-phosphorus areas white. The largest white spot is same segregated spot shown in Figs. 5 and 8.

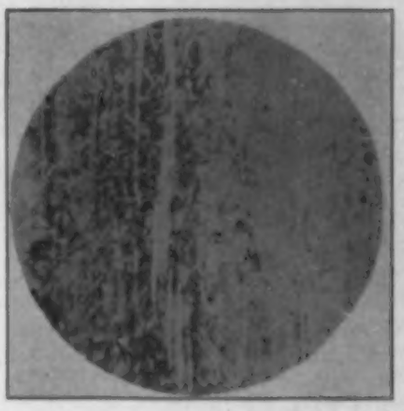


FIG. 14—EDGE OF SAME SEGREGATED STREAK SHOWN IN FIG. 11

Etched with cupric chloride and hydrochloric acid, and magnified 200 diameters. The ferrite appears black, and high-phosphorus streaks whiter than the normal pearlite.

In order that some remedy may be found for this condition it is important to understand clearly just what causes it. Two facts that are very helpful in this respect have been ascertained by numerous investigators of this subject. They are, first, that segregated streaks are found almost solely in rails rolled from the upper parts of ingots, and especially in A-rails; and, second, that they occur most seriously in "wild" heats, or "rising steel," and are not found to any extent in "quiet-setting" or "piping steel." There may be some exceptions to the first statement above, as will be explained below, but in the vast majority of cases these two statements are true. Thus the segregated streaks seem to be caused by gas which is given off by "rising steel" during solidification in the mold. It is well known that the last metal to freeze of any given ingot is always higher in carbon, phosphorus, and sulphides, than the average of the ingot. Hence if gas is given off when the steel is partly solid and partly liquid, the gas in rising to the top will take with it some of the liquid metal, which is higher in carbon, phosphorus and sulphur, and this will collect in the upper part of the ingot along the channels and in the holes formed by the rising gas. When the entire ingot finally solidifies there will thus be segregated streaks in its upper part as well as blowholes, and while the latter may be closed up by the rolling, the segregated streaks will remain in the finished rail.

This theory explains in a satisfactory way the occurrence of segregated streaks in A-rails, but some in-

vestigators have reported decidedly streaked rails that were removed from track to have been D, or E, etc., rails. To explain these the theory might be proposed that the erosion of cast-iron from the bottom-plates of the molds took place to such an extent that the high-carbon metal was not dissolved in the steel before solidification, but remained in streaks near the base of the ingot. Although this theory has some influential supporters, the writer does not consider it of much importance because it does not explain why a well-deoxidized "piping" steel is free from segregated streaks.

Another explanation that has been proposed for the occurrence of segregation and unsoundness in the lower parts of ingots is that in freezing the ingot may have formed a solid layer or "bridge" completely across its section somewhere above the middle, and this bridge may have trapped some of the gases and liquid segregate in the lower parts and thus preventing their rising. These theories may account for the few rare instances where a rail marked D or E is found to be badly streaked, but on the other hand, the chance of such a rail having been wrongly marked should not be entirely disregarded. Anyone familiar with ordinary conditions around a steel plant, at least a few years ago, will appreciate that it is not beyond the bounds of possibility that several mistakes of this kind might have been made.

Since it has been found repeatedly that well deoxidized, "quiet-setting" steel does not produce ingots with segregated streaks, the remedy for these streaks should be obvious, namely, to deoxidize the steel so well

FIG. 15—ONE OF THE SEGREGATED STREAKS IN THE FLANGE OF RAIL "Y"

Unetched and magnified 200 diameters, showing inclusions chiefly of slag, but containing enough sulphides to show plainly on the sulphur print and etched section.

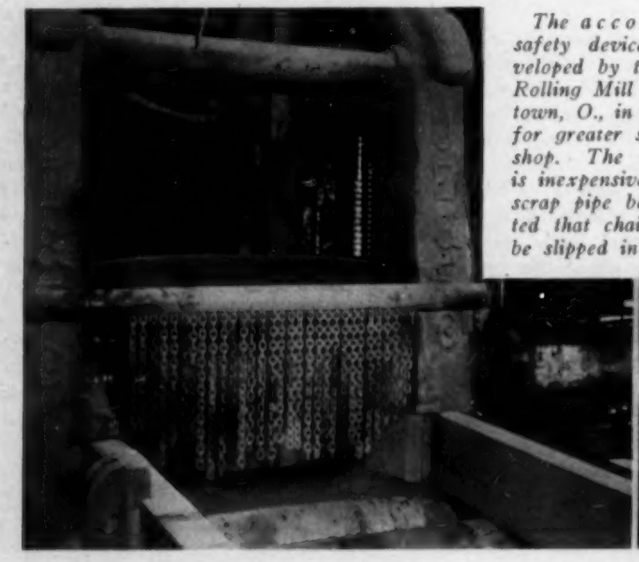
that it will not give off gas when solidifying in the molds. Any good deoxidizer will answer this purpose such as silicon, aluminum, or titanium. The latter is to be preferred, as it does not leave its oxidation products in the steel as the other two agents do. But the steelmakers are not anxious to use these deoxidizers in large enough quantities to be most efficient, because thoroughly deoxidized steel ordinarily gives piped ingots unless cast with unusual care or by some special process. With steel properly treated with ferro carbon-titanium, piping has not, as a rule, been specially troublesome if the silicon was kept low. There are also many casting processes or types of mold that reduce piping very effectively.

But it also should be understood that such processes do not prevent or lessen the formation of segregated streaks in the ingots. It is the complete deoxidation of the steel that does this, and the special casting process merely makes it possible to make ingots of well-deoxidized steel without the formation of deep pipes.

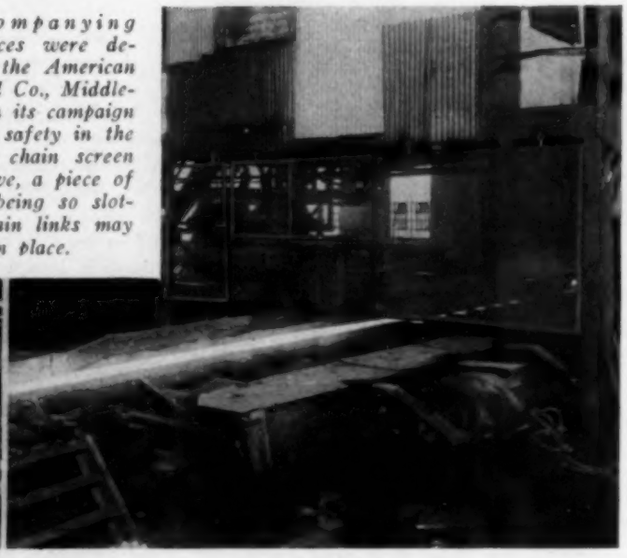
As the importance of using sound and homogeneous rails in our main railways is constantly becoming more universally recognized, it is to be hoped that steelmakers will eventually be impressed with the necessity of avoiding segregated streaks in their rail steel ingots. It has been proved that this can be done at a small additional expense and without costly extra equipment at the mills. Until it is done much more extensively than at present, no decrease in the number of split-head rail failures in this country can be expected.

Inexpensive Guards for Blooming Mills

The accompanying safety devices were developed by the American Rolling Mill Co., Middletown, O., in its campaign for greater safety in the shop. The chain screen is inexpensive, a piece of scrap pipe being so slotted that chain links may be slipped in place.



CHAIN SCREEN ON INTAKE SIDE OF BLOOMING MILL



WIRE AND CHAIN SCREENS TO PREVENT "FLASHES" ON THE BLOOMING MILL

Function of Slags in Ore Reduction

This Article, by an English Authority, Gives an Unusually Complete and Scientific Discussion of the Action of Various Slags, and Their Effect Upon the Other Materials

BY J. E. FLETCHER

NOTHING is more disastrous to the production of uniform pig iron than a furnace which is unevenly charged, allowed to run away from the men, or, if automatically charged, subject to stops through faulty mechanism or intermittent raw material transmission. Lack of uniformity results from uneven distribution of ores and limestone which is especially liable to occur when charging mixed ores. Assuming that a furnace working on phosphoric ores has a diameter of 11 feet at the stock line; the relative volumes of cold charged ore, flux and coke are 27.8, and 82 cubic feet or equivalent to three layers of material 0.27, 0.08 and 0.82 foot or say 3 inches, 1 inch and 10 inches thick, respectively.

With mixed ores containing say 50 per cent of lumps averaging say 4-inch to 5-inch cubes, and 50 per cent of fines, with limestone charged in lumps varying from fines to 4-inch cubes, it is not conceivable that the limestone can uniformly distribute itself over the mixed ore. The limestone lumps obviously fall in the gaps between the ore lumps, and when afterwards in the descent the limestone calcines the fine lime is most intimately mixed with the fine portions of the ore, and the large ore lumps are very liable to be left isolated, to catch what lime they can.

As the charge descends and the limestone is calcined the lime occupies about double its original bulk and tends to somewhat correct the above-mentioned evil, but there can be little doubt that the iron reduction begins first in the fine ore clots, in the path of the reducing gases which carry off some of the fine lime, coke and ore into the downtakes. Before the iron reduction takes place the ore, lime and fuel bulk has increased by about 20 per cent owing to the increased lime bulk and the slight expansion of the ore and fuel. At the point when iron reduction begins there must be a quick contraction and by the time the top of the boshes is reached the bulk of the ore, lime and coke will probably be about 15 per cent greater than when charged. This shrinkage during the descent through the body of the furnace aids the ascent of the gases, and would be more pronounced but for the fact that carbon deposition during the reduction of the iron helps to slightly swell the mass. It is probable, however, that as this deposited carbon may be the means of carbonizing the reduced iron the shrinkage will continue into the neighborhood of the boshes.

A little consideration will show that where the lumpy ore and large limestone lumps happen to fall together there may be retarded reduction and calcination, and the two may fall into the hearth before being assimilated. And generally, as the lumpy ore is not reduced until lower down the furnace than the fine, the time of travel is not sufficient for complete carbonization and the resulting pig iron will be low in total carbon. Again, such a succession of accidents as are above brought about by the presence of too large lumps of ore and limestone, and the quicker travel and reduction of the fines, must tend towards slipping, causing successive jams in the body of the furnace. The experience of American furnace designers illustrates this point. The in-wall lines of the furnace body have been made increasingly steeper so as to obviate the sticking which occurred with earlier more parallel forms of furnace walls.

Natural Slags

The intimacy of contact between the silica, lime alumina, etc., in the gangue of an ore must make for the primary formation of slags having often very different compositions to that of the final slags which run from the slag notch, and it is not difficult to see that when using mixed ores there must be formed in the boshes a variety of slags each resulting from its own ore. These slags, later, when seizing on the available lime in their immediate neighborhood, run down into the hearth, and mixing together form the final slags.

The gangue slag formed from a limey Lincolnshire ore is of the easily fusible fluid type with about 45 per cent SiO_2 and 14 per cent Al_2O_3, softening at about 1,355 degrees Cent. whereas that from a Scotch blackband ironstone, owing to the high alumina content softens at 1,440 degrees Cent. A mixture of two such ores would probably result in uneven reduction and descent. The first would soften and begin to flow down into the boshes before the second softened. Further, as the contact with the free lime would commence first with the Lincolnshire ores as they slipped into the hotter zones of the boshes, liquidity of both reduced iron and slag would progress with far more rapidity than would be the case with the Scotch ores alone. If, therefore, during charging, the above ores were so distributed as to descend, the one ore on one side of the furnace and the second on the other side the smelting would proceed unevenly and the quality of the product would be affected. It is obvious that great care is needed in charging two ores having gangue slags of different fusibility. It has often been stated that a furnace works more regularly on a mixture of lean ores than on one consisting of rich and lean ores.

As the iron commences to reduce it descends, owing to its higher specific gravity, more rapidly than the gangue, the surface of which is left open to the influence of the surrounding lime. If the ore is not too lumpy it is clear that as the iron is reduced it facilitates the formation of homogeneous slags because the honeycombed mass of gangue from which iron particles are escaping, is free to the attack of the CO gas and to the contact with the free lime which surrounds it. Here again the possibility of irregular descent is seen, for where lumpy ores and a shortage of adjacent lime occur in clots or colonies, there local silicious or scouring slags are liable to occur. The shortage of lime in such areas leads to oxidation of iron, and slag clots high in iron oxide are formed when such occur next the boshes or lining, the brickwork being robbed of silica to satisfy the hungry demand of the ferrous silicate.

With certain types of automatic charging devices the tendency to feed the lumpy ore down one side of the furnace has led to hot spots at definite positions in the lining, which has been eroded at such areas. The reducing gases have been able to climb into these loosely packed zones or pockets, combustion has taken

Presented in March, 1916, before the Staffordshire Iron & Steel Institute, of which the author is president.

place, and in the absence of sufficient lime scouring slags have eroded away the brickwork. In one such case a furnace was destroyed practically after a few months' run. It was found that although the mean slag analysis was normal, that of the slag adhering to the eroded portion was highly silicious and rich in iron. By altering the charging mechanism more uniform feeding and even burden distribution was obtained, the new furnaces thus altered running for years without further trouble on this account.

Descent of the Gangue

As the gangue or earthly matter of the ores descend into the boshes the temperature becomes high enough to fuse it and each ore produces initially a natural slag of its own. As it descends further into still hotter zones in contact with the free lime the slag composition changes, each temperature reached corresponding to the equilibrium of the slag formed, the volume of the slag progressively increasing as the hearth is approached.

It is possible that a certain amount of metalloid reduction takes place before reaching the hearth or tuyere region, seeing that there must be contact between the particles or reduced and carbonized iron and the slag as they descend together. The iron, more or less eutectic, being fluid in the boshes, flows more rapidly than the slags, and on this account cannot absorb silicon, phosphorus or manganese to any great extent until it meets larger bulks of slag. The reactions between iron and slag depend largely upon the carbon present in the molten iron. The entrance of Si, Mn and P into the pig iron is simply an exchange between the oxides of silicon, manganese and phosphorus and carbide of iron. Silicide of iron, carbide of manganese and iron phosphide are the forms in which the elements Si, Mn and P are finally found in the molten and solid pig iron.

Progressive Absorption of Lime

In the case of ores containing small lime percentage the natural slags are, of course, highly silicious and rapidly absorb lime until a slag containing from about 33 to 37 per cent of lime is formed, after which, if lime is available, the lime content increases slowly.

When the character of the slag changes from acid to basic the slag rapidly becomes viscous and of higher fusion temperature. This change begins when the sum of the basic oxides CaO, MnO and MgO exceeds 50 to 55 per cent. The slags then formed readily fall to powder on cooling, especially if the lime content exceeds 48 per cent. Where the ores contain high lime or manganese, the gangue slags are very fusible, and have a softening temperature of about 1,360 degrees Cent.

An examination of the changes of the analysis of the slag during the elimination of silicon, slag and manganese opens up an interesting question. First, the ores with but little gangue and which require but little time to flux them alter most in character during the reduction of silicon. Thus hematite ore, the slag which on entering the hearth has SiO_2 content of 45 per cent and CaO of 43 per cent on leaving the slag notch, after yielding a gray pig containing 2½ per cent Si has 38 per cent SiO_2 and 49.5 per cent of CaO. A Northampton iron demanding twice the flux for its working has its slag composition changed from 37.6 per cent SiO_2 and 44.5 per cent CaO on entering the hearth to 36 per cent of SiO_2 and 48 per cent of CaO on leaving the slag notch after yielding a gray pig of 2.5 per cent Si. The greater the slag volume the less is its composition affected during silicon reduction, and providing the slag composition allows of a sufficient liquidity the product is likely to be more regular. When the sum of silicon and alumina per cent does not exceed 50 and is less than 45 the slags are fairly fluid, if the Al_2O_3 content does not exceed 15 per cent. With higher alumina the slags are more refractory and are dense and hard, and gray in color when solid.

The Action of Flue Cinder

The most sensitive slags, therefore, are those whose composition varies most per 1.0 per cent of Si transferred to the pig iron from the slag, and whose temperature of fusion varies most per 1.0 per cent of Si transferred from the slag to the corresponding pig iron.

Flue cinder being a slag descends into the boshes and possibly into the entrance of the hearth before it melts, and runs with high fluidity into the slag, mixing with it and greedily absorbing lime therefrom, while the ferrous oxide is reduced in content with the coke, $Fe_2O_3 + 3C$ becoming $3CO + 3Fe$. The iron released is not carburized like that which reaches the boshes from the other ores, and hence the tendency is to make a pig iron of lower carbon content. If the flue cinder accidentally flows down locally on one side of the furnace, iron having a mixed or scattered fracture is likely to accrue. If the slags from the ore mixed with it are difficient in lime it will readily be seen that scouring slags may be formed and run down the boshes, robbing silica and alumina from the lining and leading to short life of the furnace. Generally, however, the lime added to the charge forms a slag first with the ores and this may be of a highly basic nature before the molten flue cinder runs into it and is absorbed by it. Under any circumstances the action of flue cinder tends to irregularity in product.

Sulphur, Manganese and Phosphorus in Slags

The combined lime, manganous oxide and magnesia in normal slags averages 50 to 55 per cent. The saturation of slags with basic oxides CaO, MgO and MnO depend largely on the temperature under which they are formed. If that temperature is exceeded and there is available an excess of CaO or MgO, manganese is reduced from the slag. It is under such conditions that sulphur is also absorbed by the slag, the excess lime uniting to form CaS which union is probably assisted by the disassociation of the MnO in the slag as manganese passes into the pig iron. It is pretty certain that a basic lime slag will desulphurize iron the more efficiently in proportion as the MnO and FeO contents of the slag are reduced, in so far as the latter is in a fluid condition. When the fusion zone in a furnace is kept low down the conditions for the production of low sulphur iron are most favorable. All blast furnace slags are really acid in nature and the sum of SiO_2 and P_2O_5 therein exceeds 25 per cent beyond which point dephosphorization of the iron cannot occur. Hence the phosphorus in the normal slags must all or nearly all pass into the pig iron. The liquid condition is here also favorable to the slag dephosphorizing action as might be expected. The lower temperature of acid slags containing 35 to 45 per cent of SiO_2 is favorable to the rapid passage of the phosphorus from the slag to the pig iron.

Speed of Burden Descent

A lean silicious ore demanding heavy lime and fuel complement passes through the furnace at a very different rate to rich ore with small flux additions and low fuel ratio, both being blown with a view to maximum output of iron.

Suppose we have two ores each being smelted in a furnace having 70 square feet of hearth area and 11,000 cubic feet capacity, the rate of coke consumption per square foot of hearth

area being three pounds in each case or say 210 pounds coke per minute. If the one ore mixture contains 35 per cent of iron, demanding 30 per cent of limestone and 67 per cent of coke, and the other contains 55 per cent of iron demanding 10 per cent of limestone and 50 per cent of coke, then the relative volumes of materials in the furnace being charged will be ore, 27; limestone 12; and coke, 160 cubic feet for the 35 per cent mixture, and ore, 25; limestone, 8; and coke, 140 cubic feet for the 55 per cent mixture. The speed of smelting is 3.37 tons per hour for the former and 5.15 tons for the latter. Time occupied by burden in passing through furnace for the 35 per cent Fe mixture is 19.7 hours, and for the 55 per cent Fe mixture, 22.8 hours. Now the hearth contains about 40 tons of iron at tapping necessitating with a 35 per cent Fe mixture casting once every 12 hours, whereas at the 55 per cent Fe mixture casting every 8 hours is necessary to secure satisfactory results.

The iron smelted from the 35 per cent Fe ore mixture fills the hearth at the rate of about 3 inches per hour, while its slag rises at the rate of 12 inches per hour. In the rich ore mixture the iron is smelted at the rate of 4.5 inches per hour and the slag rises in the hearth at the rate of 9 inches per hour.

Thickness of Slag Blanket

The average thickness of the slag blanket during smelting is 24 inches in the case of the 35 per cent Fe ore, and 20½ inches in that of the 55 per cent Fe ore. In the first case the iron is subject to the influence of the slag for 12 hours between tappings, and in the latter 8 hours.

As a rule, it may be reasonably inferred that the quality of iron being produced varies, if during this period the blast volume and temperature remains constant, the more silicious iron being produced just at the commencement and towards the end of the periods between tappings.

It must be recognized, therefore, in conclusion, that the scientific examination of the slag problem lies at the root of iron blast furnace working. The volume of slag per unit of iron made is the factor regulating the heat equivalent coke required for the smelting. The ash in the coke requires further lime to flux it, and again this additional slag makes further demand on the coke. The slag volume, again, limits the output of the furnace and controls it. It has already been seen how the quality of iron required is dependent on the slag composition. It is obvious that other charges, the cost of supplying and heating the blast, of the transport of raw materials to the furnace and the disposal of waste material afterwards are proportioned to the slag volume which is dealt with per ton of iron produced.

Pulverized Coal for the Open Hearth

BY J. P. KITTREDGE

THE application of pulverized coal to open-hearth furnaces offers different and interesting problems to engineers and furnacemen. The following observations on the use of this fuel are based on the experience gained in a plant where pulverized coal has been used in a basic open-hearth furnace for four years. The first experimental heats were made successfully and the important information, as to whether or not the siliceous ash would deposit on the basic slag, was determined by taking frequent tests of the slag during the progress of the heat and comparing them with tests taken in a similar way from the slag of a furnace using oil as a fuel. It was found the ash had little, if any, influence, indicating that it was not being deposited on the slag in any great quantities.

With this point settled and the conclusion reached that high temperature and rapid time could be obtained, permanent equipment was installed for four 30-ton furnaces which have been in continuous service ever since. The equipment was further extended to serve three smaller open-hearth furnaces in another part of the plant. The entire open-hearth capacity of the plant is now being operated with pulverized coal as a fuel and approximately 6,000 heats have been made to date. This is cited to illustrate that at the plant referred to, the use of pulverized fuel for open-hearth furnaces has passed the experimental stage.

The time required to make heats is largely dependent upon furnace design, but there has been no difficulty in making heats with pulverized coal in the same time that they could be made with fuel oil in practically the same open-hearth furnace.

Decrease in Oxidation

Mr. Fuller has emphasized the matter of decreased oxidation, due to the pulverized coal fuel. I regret we have not been able as yet to determine definitely and to our complete satisfaction that such is the case, because of the many variables which enter into melting cold charges, that is, the nature and analysis of the scrap used, the time the heat is in the furnace, and the condition of the slag. Taken all in all, we can safely say that the oxidation is not greater than with fuel oil or producer gas practice.

The large quantity of ash with which we must contend offers by far the greatest problem to solve. Let us reason that with a comparatively small furnace, burning one ton of coal per hour, 4 to 10 per cent of such coal is not combustible. To attempt to pocket or catch all this ash in the checkers would mean an unreasonably short life of the checker chambers before clogging. This readily leads us to conclude that a means of passing as large a percentage of the ash as possible through the checkers, and thence out of the stack, is the most logical course to follow. To reach this result it is also reasonable to assume that the effluent gases containing the ash should travel at a comparatively high velocity and with as few changes of direction as possible. Where the change of direction is unavoidable such places should be accessible so that the deposited ash may be artificially agitated, causing it to be picked up by the draft and carried to the stack. It is quite important that no passageway for the effluent gases through the checkers be allowed to become clogged, as that immediately tends to increase the deposit at such a point.

The slag collected in the pockets of the pulverized coal furnace is considerably greater than that of the oil or producer gas type, and it is important that arrangements be made to facilitate its removal by means of slag cars or otherwise. It should be the aim of the engineer, in designing the equipment, to make the reversing operation, slag removals, and all duties required of the furnacemen and helpers, as free from arduous labor as possible, as the enthusiastic co-operation of the furnacemen is, of course, essential to success.

In conclusion, we have found the results obtained from the use of pulverized coal furnaces have been very gratifying, in regard to economies obtained, and expect to see wide development in the application of this fuel to metallurgical furnaces.

A discussion of Mr. Fuller's paper on "The Use of Pulverized Coal as a Highly Efficient Fuel for Metallurgical Furnaces," which was presented at the St. Louis meeting of the American Iron and Steel Institute. The author, J. P. Kittredge, is manager, the National Malleable Castings Co., Sharon, Pa.

WHAT'S WHAT and WHY

Don't Ask Yourself-Ask Us!

Questions from our Readers answered by Experts

Compressing Acetylene

We would like to compress acetylene for portable repair outfits about the plant, but we are informed that the process is dangerous. Kindly let us know what precaution must be taken for safety on work of this kind. We make and use considerable low-pressure gas.

The compression of acetylene should not be undertaken by the general user of the gas. It is much better and a great deal safer to secure the supply from those who are specially equipped and trained to compress it. Refer to the advertisements in *The Iron Trade Review.* Acetylene is liable to explode simply by concussion when compressed to 30 pounds or over, and as the usual service tanks are supplied at 250 pounds or over, the process of compressing and storing the gas must be done scientifically and with special care. The compression system is special, and the gas must be dissolved in acetone to prevent explosions. The tanks must be completely filled with a porous material to prevent pockets of gas accumulating free from the acetone. The steel bottles contain dissolved and not liquified acetylene, and must be used strictly according to the directions to insure safety.

Ways of Making Gasoline

Kindly let me know if there is any way of making gasoline other than the refining process that separates it from the crude oil.

Gasoline is produced by refining from crude oil and from natural gas. There are a number of different processes for getting it from crude oil, but only one is used to recover it from natural gas. This is mechanical, and is a combination of compression and refrigeration. Upwards of 70 millions of gallons of gasoline are produced in this way each year, and it is virtually made from a waste product. The gas used is from abandoned oil wells or from those whose production is very low. A number of such wells are connected to a suction pump and the gas delivered to compressors that raise it in separate stages to from 20 to 150 pounds or more. Water-cooling is arranged to remove the heat of compression, and the expanding gas also plays a part in the refrigeration. The gasoline produced ranges from 90 to 98 Baume.

Charcoal Iron

Will you kindly give me a definition of charcoal iron, a typical analysis of charcoal iron, and explain the difference between a charcoal and an ordinary foundry iron?

Charcoal iron is made in blast furnaces with wood charcoal as fuel. It is distinct from coke and anthracite pig iron.

It is difficult to give a typical analysis of charcoal iron without knowing to what use you intend to put it. Charcoal iron is sold in about 15 different grades, running from AA Scotch to No. 6. The former carries 2.62 per cent and over of silicon, while the No. 6 has a maximum of 0.05 per cent of silicon. A representative grade is Low No. 2, which carries 1.13 to 1.37 per cent silicon, 0.15 to 0.22 per cent phosphorus, 0.30 to 0.80 per cent manganese and 0.025 per cent and lower of sulphur. Charcoal iron is graded according to its silicon content.

It is claimed for charcoal iron that it increases both the tensile and transverse strength and gives a greater density of grain structure. Charcoal iron has been widely used for years for making chilled rolls and cast iron car wheels, as well as a great many other products. Owing to the fuel used, the sulphur is low. It is frequently stated that charcoal pig iron will have different properties from a coke iron of the same analysis. The explanation advanced for this is that the difference in blast furnace practice has an influence, as yet not thoroughly understood, on the product. Some attribute this influence to oxygen.

Dies for Rivet Headers

We are having trouble with our rivet header dies. They don't stand up on hot work. What is the best steel to use for header dies, and how should it be hardened?

Some rivet makers have good success with air-hardening steel for hot dies. With so many good steels on the market, no one is likely the best. As an example in hardening, however, it might be mentioned that those who use "Peerless A" steel heat it very gradually in coke up to 1,400 degrees Fahr. Then it is put in an oil-fired muffle furnace and raised to 2,200 degrees Fahr. It is then allowed to cool in the air when it becomes glass hard.

Members of Federal Boards

What salaries did congress provide for members of the tariff commission, the shipping board and the farm loan board, and of how many members does each consist?

For some reason not satisfactorily explained, the members of the tariff commission and shipping board will receive a salary of only $7,500 annually, while members of the farm loan board will receive $10,000. The farm loan board has been appointed and is made up of four members. The shipping board will have five members and the tariff commission six.

Natural Gas Supply

Is the production of natural gas declining?

The use of natural gas has declined in some sections and increased in others. According to the government reports, its use as a whole has been increasing, and the latest report gives the present consumption at the rate of about 6½ billion cubic feet per year.

Circulation in Horizontal Boilers

BY PAUL A. BANCEL

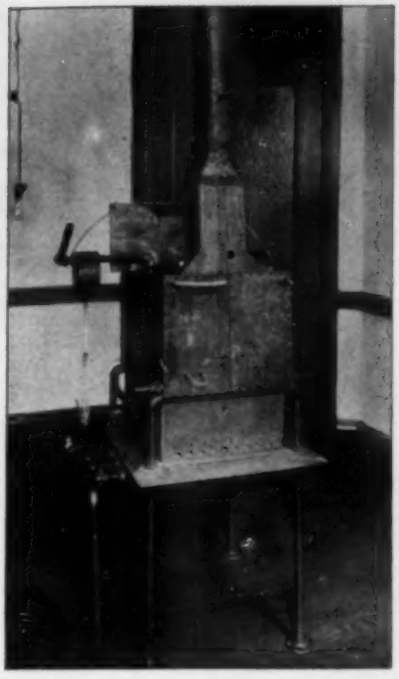


FIG. 1—MODEL BOILER SHOWING COVER PLATES

FIG. 2—MODEL BOILER WITH OUTLET PIPES AND GAGES

WITH high combustion rates and high furnace temperatures, the load on boiler surfaces exposed directly to the fire is very intense. For a furnace temperature of 2,500 degrees Fahr. and a boiler temperature of 400 degrees Fahr., the rate of radiation per square foot of boiler surface is about 100,000 British thermal units per hour; for 2,750 degrees Fahr., 150,000 British thermal units, and for 3,000 degrees Fahr., 200,000 British thermal units, corresponding approximately to loads of 100, 150 and 200 pounds of steam per square foot respectively, whereas the load averaged for all the surface in a boiler is usually only 3.5 to 10 pounds per square foot. It is important that the tubes subjected to these loads shall have ample circulation of water, and be kept clean of scale as well, otherwise the resistance to heat transfer on the water side of the tube will increase, causing an increase in temperature of the metal, which if high enough, will result in rupture. An increase in tube temperature will also decrease the heat absorbed by radiation, and will reduce the efficiency of the boiler. It is only in the region of these tubes that the velocity of circulation can have any appreciable effect on the efficiency of heat absorption. In addition, it is generally believed that a high velocity of circulation will retard scale formation and thus indirectly reducing the resistance to heat transfer and preventing overheating of the tubes.

Before considering the complex circuit of the actual boiler, let us consider a simple boiler, with one leg containing solid water and the other a rising column of steam bubbles and water. The conditions may be likened to those in an air lift wherein the aeration of a column of water forming one leg of a U creates the flow. In general the two fluids must be considered as moving at different velocities, the steam being said to "slip" through the water approaching, as an extreme, a condition wherein only the steam acquires velocity and the water is stagnant.

If there were no resistance, the acceleration of a bubble of steam would be about 4,000 feet per second. But the resistance reduces the velocity attained by the steam and at the same time imparts velocity to the water, so that the two velocities tend to approach each other; the more minutely subdivided being the steam, the greater being the resistance to its free rise through the water. In other words, the smaller the bubbles, the less the slip of steam through the water. When the subdivi-

From a paper read at the last annual meeting of the American Society of Mechanical Engineers, New York.

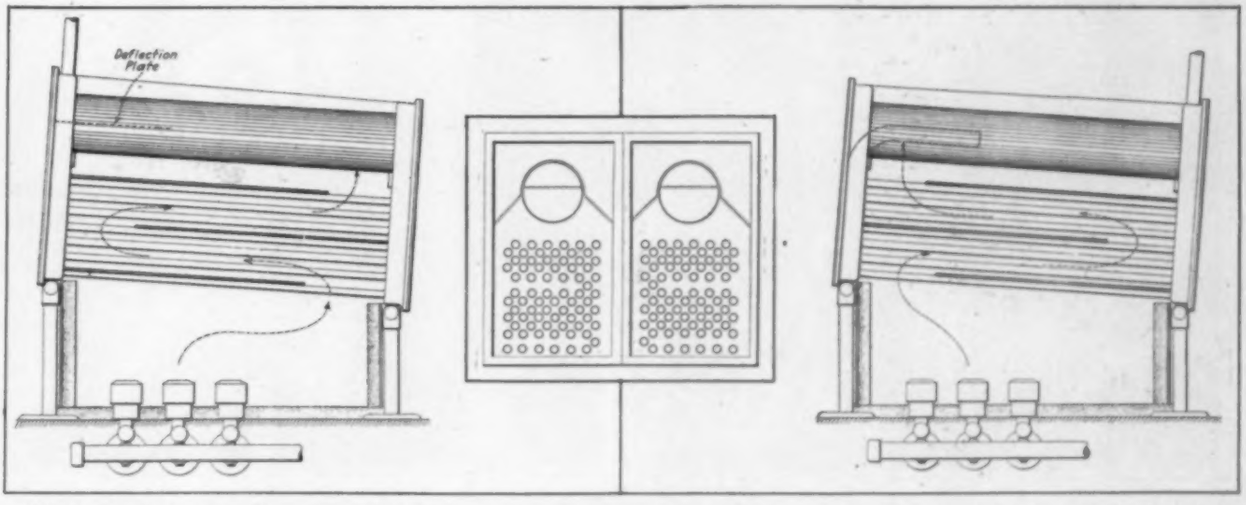


FIG. 3—MODEL OF WATER TUBE BOILER. FIG. 4—END VIEW OF MODEL BOILER. FIG. 5—ANOTHER ARRANGEMENT OF MODEL BOILER

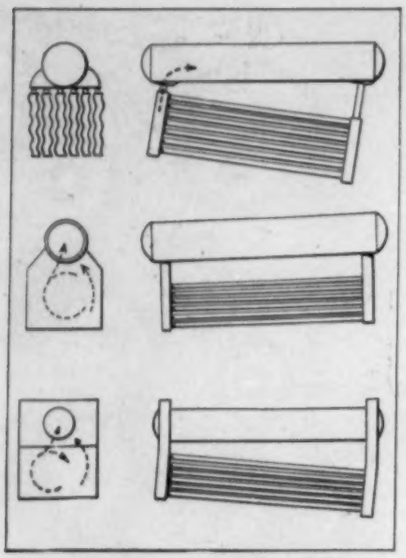


FIG. 6—THREE TYPES OF WATER TUBE BOILERS

sion is very great, an emulsion is formed; and it may be assumed that the steam and water flow together at the same velocity. The mixture is homogeneous, and its specific gravity depends on the volumes mixed.

In a simple U tube circuit without resistance, the velocity of a homogeneous mixture would be $v = \sqrt{2gH}$, where H is the head measured in terms of the steam water mixture. The velocity may also be expressed in terms of the total volume of steam and water circulating, the cross section and time, giving the expression:

$$v = \phi \sqrt[3]{\frac{Vh}{A}}$$

where V is the volume of steam per hour, h the distance from center of heating of tube to water level A, is the cross section area and ϕ is a coefficient dependent on slip and resistance. This expression indicates that, if the coefficient remained constant, the velocity would increase as the cube root of the steam volume or load; that is, if the load were doubled, the velocity would increase 1.26 times. But this condition does not exist, except in the frictionless U-tube circuit without slip, and is far from being attained throughout the entire circuit of commercial boilers. Experiments with the air lift indicate conditions which are favorable or unfavorable to slip. The quantity of water delivered rises to a maximum, when the two fluids are equally mixed by volume, or when the specific gravity is 0.5. The specific gravity falls off thereafter, owing both to the increasing air volume and to the decreasing water volume. These experiments indicate that slip and friction change the relation of air volume and mixture velocity to nearer a square root law as compared to the theoretical cube root relation. The greater the proportion of air to water the less is the slip.

Slip and Velocity

Slip is also influenced by the velocity, the ratio of air to water in the mixture remaining constant. In a mixture containing 25 per cent water and 75 per cent air, at all velocities, the head lost rises rapidly at low velocities, but falls to a straight line at higher flows, whereas a friction head alone would rise approximately as the square of the flow. The loss in slip, therefore, decreases as velocity increases. The comparatively large loss at low velocities is particularly noticeable. While the results of these tests are not reduced to general laws, they define the conditions essential to good circulation. These we can now

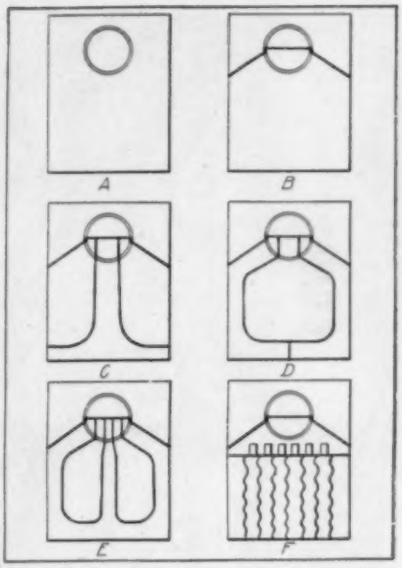


FIG. 7—VARIOUS TYPES OF HEADERS TESTED

apply to the circuit of the actual water tube boiler, which contains a number of sharp turns and abrupt changes in flow area, and is composed of a bundle of parallel tubes subjected to different loads, and discharging into a common header. Three different types, the Babcock & Wilcox, the Heine and the Edge Moor, respectively, are shown in Fig. 6. In these boilers, the steam volume formed in each tube decreases upward from the furnace, and the specific gravity of the discharged mixture increases. This results in an increasing heaviness of mixture from the bottom to the top of the front waterleg, and tends to choke circulation in the bottom tubes. The cross sectional area of the front header being relatively large, an abrupt decrease in velocity occurs at the point of discharge

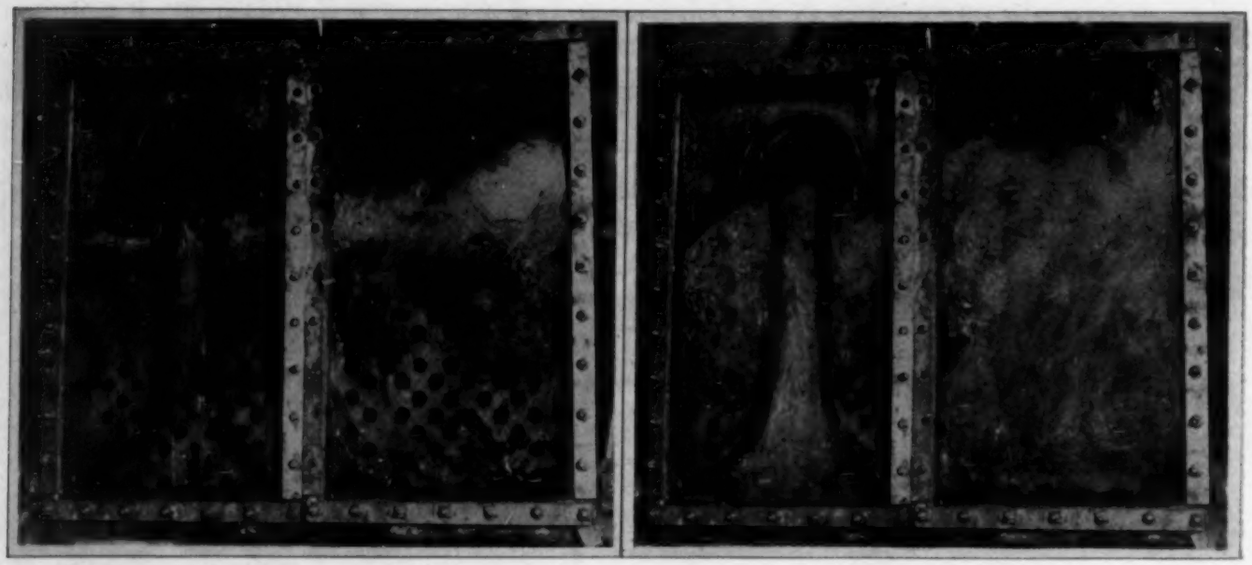


FIG. 8—FRONT HEADERS, LOAD 85 PER CENT, SETTING AS IN FIG. 5. FIG. 9—FRONT HEADERS, LOAD 275 PER CENT, SETTING AS IN FIG. 5

MODEL BOILERS WITH VARIOUS LOADS AND SETTINGS

Fig. 10—Front headers, load 450 per cent, setting as in Fig. 5. Fig. 11—Lower section of same boiler as in Fig. 10, load 250 per cent, setting as in Fig. 5. Fig. 12—Front headers, load 275 per cent, setting as in Fig. 3. Fig. 13—Front headers, load 500 per cent, setting as in Fig. 3. Fig. 14—Front headers, load 450 per cent, setting as in Fig. 3. Fig. 15—Front headers, load 450 per cent, setting as in Fig. 3

of the bottom tubes, so that the steam tends to slip up without lifting the water. In the upper part of the header, the mixture comes from the tubes at a relatively small velocity, and contains less steam, so that the conditions favorable to slip still exist. In fact, liberation of steam commences within the header, and the water tends to remain in place as in a large vessel—a tubular boiler, for example—instead of being pumped up into the drum. The head-producing flow of water from the waterleg into the drum is created almost entirely by the tubes, and principally by the bottom rows, whereas the rising steam bubbles in the waterleg should greatly assist the circulation in the tubes. Under these conditions, the higher the boiler, the poorer may be the circulation. In applying formulas of the kind given, however, it is assumed that the head-producing velocity is measured by the height from the center of the tube to the water level, and increases with the height of the boiler. In all these instances, there is a certain amount of resistance to circulation, principally that due to the sharp turn and constriction at the point of discharge of the front header into the drum, which is increased if a horizontal baffle or deflection plate, lying across the path of the steam and water, is used. A smooth large radius elbow is preferable. In the Babcock & Wilcox type the discharge occurs through nipples, and the reduction in area from the header to the nipple is considerable. In the Heine type, the discharge is through an opening in the drum of one half, one third, or less, of the flow area in the header. In the Edge Moor type, the header is carried up full width, but some head is lost, since there must be sufficient hydraulic gradient to cause the flow from the header into the drum, which probably always acts as an open channel.

An expression for the velocity in any row of tubes, or in any other part of the circuit, cannot be written, since it would have to take all these indeterminate variables and coefficients into account, and therefore the effect of changes in design cannot be predicted with mathematical precision. It seems to follow, however, that the velocity in the bottom tubes can be increased if the front header is designed so that the discharge of steam and water from those rows is isolated and led up into the drum in its own section of the header, as shown in *C*, *D* and *E*, Fig. 7. The light steam-water mixture discharged by the bottom tubes does not impinge upon a denser mass of slowly moving fluid in a larger chamber, being instead segregated all the way up into the drum. The velocity of the mixture is maintained at its original figure so far as possible, and abrupt changes in velocity are avoided, thus largely preventing the occurrence of slip. While only the same total inlet area to the drum is available, half or more is allowed for the discharge of the lower tubes, and resistance due to construction at this point is avoided. The circulation flues are carried up into the drum, and should make a smooth large radius bend, preserving constant cross section. A horizontal extension of the flue in the drum, shown in dotted lines in Fig. 5, provides separate liberating space for the large volume of steam formed in the bottom tubes, which under those circumstances does not have to boil up through any superimposed water.

In order to study the circulation and the nature of the flow in different types of horizontal boilers, a model was constructed, as shown in Figs. 1, 2, 3, 4 and 5. The boiler was built in two units, each complete with drum headers and tubes. There were 75 ½-inch outside diameter No. 18 B. & S. brass tubes about 2 feet long, of a total surface of 17 square feet in each unit. The headers were rectangular, as in an Edge Moor boiler, and by inserting suitable strips of brass the design could be changed to represent the different constructions shown in Fig. 7. Glass covers were placed on the front and back headers to permit observation of conditions and the taking of photographs. Rubber packing formed of split rubber tubing was placed on the edge of the strips under the glass, and this explains the seemingly large thickness of partitions. The boiler was set with a slope of 1 inch to the foot over a gas furnace consisting of three large burners capable of burning 200 cubic feet of gas per hour. One-inch asbestos lined the furnace and boiler casing. The baffling for the gases was of the parallel type, in two passes. The boiler was set so that the gases entered at the rear of the bottom pass, as illustrated in Fig. 8, and also with the relative position of the furnace reversed, the gas entering the first pass directly in front, as shown in Fig. 5. An induced draft fan drew the gases through the boiler. Photographs of the moving steam and water in the headers were taken at a speed of approximately 1/100 seconds by means of flashlight illumination. At first, experiments were made with water tinted red and also with water containing powdered mica, but

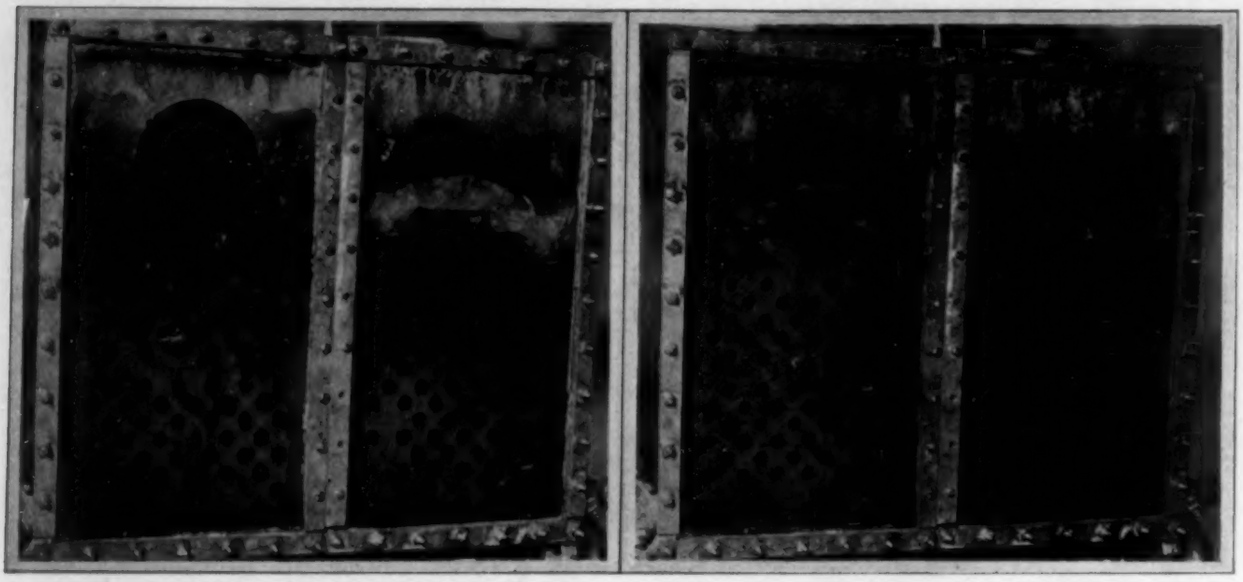


FIG. 16—REAR HEADERS CORRESPONDING TO FRONT HEADERS SHOWN IN FIG. 15, LOAD 85 PER CENT, SETTING AS IN FIG. 3. FIG. 17—REAR HEADERS CORRESPONDING TO DESIGN OF FIG. 12 IN FRONT, LOAD 85 PER CENT, SETTING AS IN FIG. 3.

these proved of no value, and no coloring was subsequently used in the water.

When the circulation is poor and steam is slipping through the water the latter shows up transparent and the header appears almost empty. Whereas where the steam and water are well mixed or emulsified, there is, in the photographs, a distinct whitish color and marked contrast in the photographs. Before a photograph was taken, the water was brought to the same level in each header without having the burners on. The level was slightly below the bottom of the drum in the front header. The camera was within a few feet of the boiler and the reduction was about half size, so that the movement of an inch on the original boiler equalled about half an inch in the photograph. A small group of bubbles, moving at a velocity of 1 foot per second would move 1/100 foot during the exposure and make a streak 1/200 foot, or say 0.06 inch, on an 8 x 10-inch plate. Wherever bubbles of steam appear to be at rest in the photographs, therefore, it may be assumed that their velocity was no more than 1 foot per second, while streaks indicate higher velocities.

Steam was generated at atmospheric pressure and the volume was measured by orifices in the outlet pipes on each half of the boiler. As the volume of steam at atmospheric pressure is very great compared, for example, to that at 200 pounds, a low load in pounds per square foot per hour on the model corresponds to a high load in terms of steam volume. The equivalent loads given in connection with the illustrations are based on a boiler pressure of 200 pounds, at which the steam volume is about 0.08 that at atmospheric pressure. A greater proportion of the steam was generated in the bottom tubes. The relative loads in different rows was probably about the same as the average in an actual boiler, wherein the distribution varies considerably depending on the furnace temperature. Fig. 8 shows the circulation in the front headers at about 85 per cent of rating. On the left is a header with a flue for increasing circulation in the bottom tubes, and on the right the square header.

Shows Pumping Action

In the left hand half of the boiler shown in Fig. 8, the greater evaporation is obviously taking place in the bottom tubes connected to the circulation flue, where there is a well-directed upward flow. The upper tubes of the boiler discharge into their compartments of the header very quietly, and the steam slips up through the water and is liberated in the header. The pumping action, as in an air lift, is shown clearly in the central flue. The discharge is vigorous enough to strike the horizontal deflection plate in the center of the drum.

The right hand half of the boiler shown in Fig. 8 illustrates how slip occurs in a header of relatively large area; the steam slips up through the water and is liberated largely in the header as indicated by the wide belt of foam formed at the surface of the water, which is to be contrasted with the quiescent conditions on the left. The steam and water issued from the bottom tubes as a homogenous mixture filling the bore of the tubes and preserved this state as it turned up, but after a short distance it seemed to be absorbed by the comparatively large mass of water in the header. The tubes carrying lighter loads discharged steam and water from the upper part of the tube only. A rotary flow can be seen in the square header, Fig. 8. The current rises at the left and falls at the right, the velocity being low or next to nothing where the bubbles can be distinguished. Fig. 9 shows the boilers steaming at approximately 275 per cent load. Fig. 14 shows the same boilers at about 450 per cent load. The upper tubes of the left hand boiler are now working more actively, but the relatively small amount of steam generated is indicated by the fact that about half the rows of tubes can be seen through water, especially in Fig. 9, the steam slipping through without causing a flow of water. The flow in the circulation flue is smooth and full bore. On the right there is violent commotion with whirls and swirls in all directions. The steam and water rise nearly to the top of the drum which indicates the head needed to make the turn and discharge the mixture into the drum. Fig. 11 shows the lower right hand corner, almost full size, of the same type header to a large scale, steaming at an equivalent load of 250 per cent. The circulation is upward on the left and downward on the right. The rush of circulation to the left of the header is presumably due to the fact that the heat is greatest in the center of the furnace, which corresponds to the left hand side of this header. Fig. 12 shows Heine type headers in both parts of the boiler, and double circulation flues on the left, rising along the sides of the header in extensions not connecting with any upper boiler tubes. No heavy mixtures were therefore discharged into the light steam

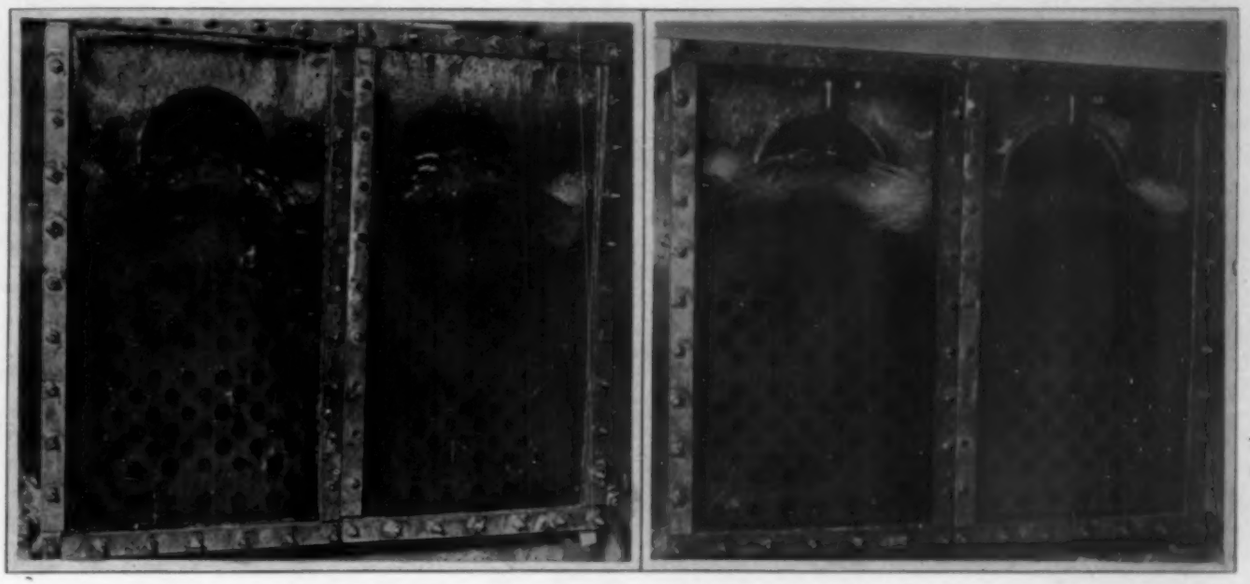


FIG. 18—REAR HEADERS CORRESPONDING TO FRONT HEADERS SHOWN IN FIG. 14, LOAD 300 PER CENT, SETTING AS IN FIG. 3. FIG. 19—REAR HEADERS CORRESPONDING TO DESIGN OF FIG. 8 IN FRONT, LOAD 450 PER CENT, SETTING AS IN FIG. 5

water emulsion rising from the bottom tubes. The load was about 275 per cent. The discharge of the upper tubes of the left hand boiler slips through the water and the mixture in the center, near the top, is moving slowly, whirling in all directions. The right hand picture illustrates again the tendency for internal circulation in an open header; there is a marked rotary flow and downward current on the right. A closer study of the figure will show what seem to be light shadows to the left of the tube ends in the bottom row. This is the discharge of steam slipping through the water. Fig. 13 shows the same boiler steaming at 500 per cent load. Fig. 14 shows the Heine type header on the right and the single circulation flue on the left, at about 450 per cent load. The white streak across the right hand header is a cemented crack in the glass. Numerous small eddy currents or whirls can be distinguished. Nearly stationary bubbles are distinguishable all along the lower section, directly in the center and in the upper right hand corner, forming the vortex of a whirl in a clockwise direction.

Fig 15 shows a third arrangement of the circulation baffle, with three flues on the left, and a Babcock & Wilcox type header on the right; the load being about 450 per cent. The flow in the sections of the Babcock & Wilcox header was directly upwards, with no cross currents or whirls and only a slight sinuous movement. It was throttled by the nipples at the top of each section. Stationary bubbles can be distinguished in many of the headers. At low loads, the slip through the headers was similar to that in the previous types, the bubbles rising through the water without causing any discharge from the nipples. Fig 16 is a view of the rear headers when steaming at the same rate. The left hand header, corresponding to the Babcock & Wilcox type on the right in front, is boiling backward from the upper tubes, causing a fluctuating and higher water level. The white mark across the bottom of the right hand drum is caused by the splashing of the water against the glass. Reversal of boiling also occurred with other types of headers tested. Fig. 17 shows the boilers with a front header, as in Fig. 12, steaming at 85 per cent. A number of tubes can be seen to be discharging steam. This occurred intermittently, and would appear first at one tube and then at another. Fig. 18 shows the rear of the boilers illustrated in Fig. 14, steaming at about 300 per cent load.

The back boiling was eliminated by reversing the boiler setting, that is, by setting the boiler over the furnace so that the opening at the end of the lower horizontal baffling came at the front and higher end of the boiler, near the front header, as shown in Fig. 8. Fig. 19 shows the rear headers when the boiler was set in this manner, and the load was about 450 per cent. The rear headers were perfectly clear, and no discharge occurred from any of the tubes. The front headers were of the design shown in Figs. 8 to 11, which figures were also taken with the flow of hot gases entering the tube nest at the front. Figs. 20 and 21 show the rear headers with the same setting, but with the Babcock & Wilcox type header at the front of the left hand boiler and the design shown at *C*, Fig. 7, at the front of the right hand boiler. The nipples of the sectional header were reduced one half in area by inserting sleeves. Fig. 20 shows a load of 300 per cent. While the true water levels were exactly the same, the left hand header shows a higher surface and also considerable commotion at the surface, due to reversal of circulation through the upper tubes. The water level fluctuated up and down, with a swing of several inches. Fig. 21 shows the same boilers, with 85 per cent load. The true water levels were equal, but when steaming, the level in the left unit fluctuated, rising and backing up the water in the drum and then falling. Tests were also made, in which the difference in pressure between the bottoms of the front and rear headers was measured. The boilers were set with the hot gases entering at the front. A mercury U tube with legs at a small angle from the horizontal was used for these readings, which were then translated into equivalent inches of water, the gage being below the bottom of the boiler.

From these experiments, it would appear that increased circulation in the lower rows of tubes of a horizontal boiler can be obtained by constructions which segregate the discharge from those tubes up through the front header into the drum, and by designing the circuit to prevent slip and to offer the least resistance, particularly at the entrance to the drum. The velocity of circulation of a steam-water mixture increases about as the square root of the steam volume or load.

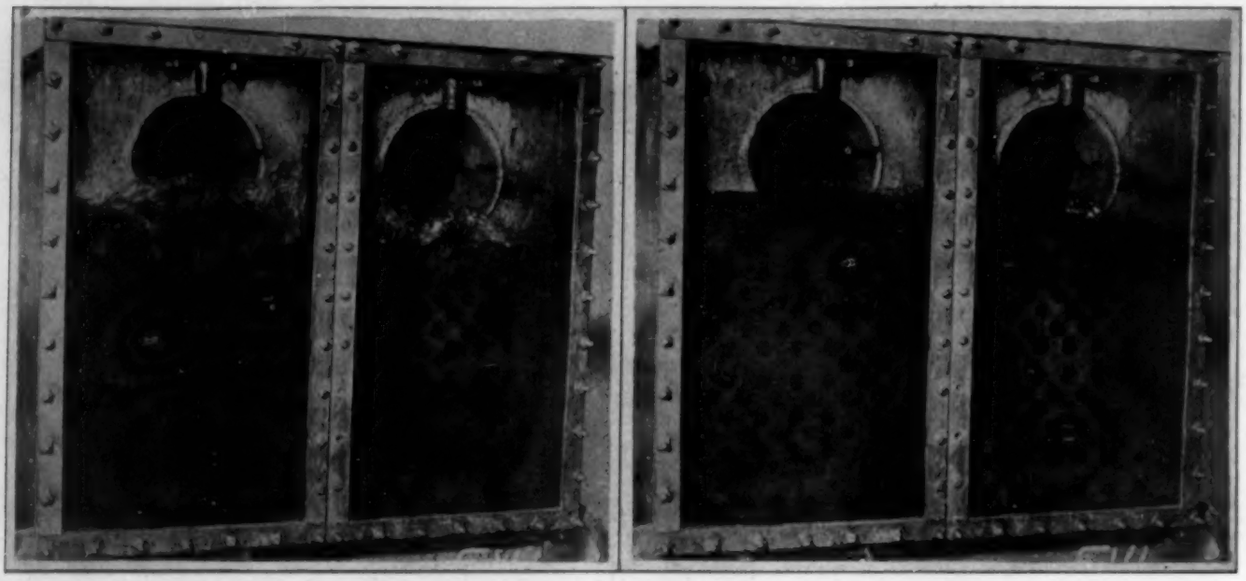


FIG. 20—REAR HEADERS CORRESPONDING TO DESIGN SHOWN IN F, FIG. 7, AT THE FRONT OF THE LEFT HAND BOILER, AND TO THE DESIGN SHOWN IN C, FIG. 7, AT THE FRONT OF THE RIGHT HAND BOILER, LOAD 300 PER CENT, SETTING AS IN FIG. 5. FIG. 21—REAR HEADERS SAME AS SHOWN IN FIG. 20, LOAD 85 PER CENT, SETTING AS IN FIG. 5

MEN OF THE IRON TRADE

Who they are . Where they are What they are doing

PHILIP FRANKEL, who ever since the inception and organization of the Cleveland Branch, National Metal Trades Association, has been its secretary and active executive officer and who previous to that time was the secretary of the Manufacturers' Association of Cleveland, has resigned his position with the National Metal Trades Association, to take effect at the end of his present term, March, or as soon previous to this time as the association can secure someone to relieve him of his duties. His brother, Frederick Frankel, who has been associated with him for many years as assistant secretary of the Cleveland Branch, National Metal Trades Association, leaves with him. They leave to take up broader work in connection with open price and trade associations, of which they already represent a number, notably in the foundry and textile trades. They will also make a study of the federal trade commission act and the problems that will confront manufacturers and business men thereunder. They will specialize in the legal end of labor problems and labor troubles. Leading manufacturers of Cleveland have already arranged to retain them for consultation. They will continue in the general practice of law under the firm name of Frankel & Frankel at their new offices, 1019-20 Guardian building, Cleveland.

Stanley D. Winger has been appointed manager of the railroad sales and service department of the Prest-O-Lite Co., Inc., Indianapolis.

C. W. Stoup, chief inspector of the Pittsburgh Crucible Steel Co., Midland, Pa., has been transferred to the Crucible Steel Co.'s plant at Norwalk, O., as works manager.

P. J. Mundie, superintendent of the merchant and bar mills of the Pittsburgh Crucible Steel Co., Midland, Pa., has resigned to accept a position in the south.

R. J. Montgomery, general sales agent of the Philadelphia & Reading Coal & Iron Co., has been elected a vice president and will continue his office as sales agent.

Fred T. Cadmus, resident engineer at Ambridge, Pa., for the American Bridge Co., has become general manager of the plants of the McClintic-Marshall Co. at Pottstown, Pa.

E. W. Pittman, manager of the Rankin, Pa., plant of the McClintic-Marshall Co., Pittsburgh, and George H. Danforth, structural engineer, Jones & Laughlin Steel Co., Pittsburgh, will give a joint paper entitled "Factors Affecting Costs of Structural Steel Shop Work", before the Engineers' Society of Western Pennsylvania on Oct. 31.

A. F. Mack, for many years the head of the export freight and ocean steamship department of the United States Steel Products Co., New York, has become president of the Federal Shipping Co., New York.

D. P. Lamoreux, formerly president of the Beaver Dam Malleable Iron Co., at Beaver Dam, Wis., is now associated with the malleable iron department of the Canadian Car & Foundry Co., at Brantford, Ont.

W. F. Davidson, until recently connected with the Reliance Steel Casting Co., Pittsburgh, is now works engineer of the Granite City plant of the American Steel Foundries at Granite City, Ill.

J. R. Morehead, who has been identified with the Pittsburgh office of Rogers, Brown & Co., Cincinnati, for 11 years, on Nov. 15 will be transferred to the Cleveland office of that concern.

Leon J. Harley Jr. and Carl O. Hedstrom, both of Springfield, have been elected directors of the Hendee Mfg. Co., Springfield, Mass., succeeding H. J. F. Knobloch and Samuel A. Miller, of New York.

A. F. Faulhaber, who has been engaged in the automobile business for a number of years, has been added to the sales force of Crocker Bros., New York City, dealers in pig iron and alloys. Mr. Faulhaber has been consigned to the Cincinnati office of this company, of which Herbert Topp is manager.

Thomas F. Cole has resigned as president of the Greene-Cananea Copper Co. He is succeeded in this office by William D. Thornton, president of the Greene Consolidated Copper Co. Mr. Cole also has resigned as director of the Inspiration Consolidated Copper Co. It is understood his withdrawal from these companies is due to his desire to lighten his responsibilities.

John H. Schuler, metallurgical engineer, identified with the Fuller Engineering Co., Allentown, Pa., has been appointed manager of an office recently opened at 706 Farmers Bank building, Pittsburgh, by the Fuller company and the Lehigh Car Wheel & Axle Works, with works at Catasauqua, Pa. Mr. Schuler formerly was connected with the Allentown office of the Fuller company. Associated with him is W. Butler Neide, who was transferred from Catasauqua to Pittsburgh.

H. F. Stocker, recently identified with Trimble, Mudge & Co., Inc., Pittsburgh, on Nov. 1 accepted a position as assistant district manager of the Cohen-Schwartz Rail & Steel Co., St. Louis, with offices in the Oliver building, Pittsburgh. Mr. Stocker has been connected with the iron and steel scrap trade for about 13 years, and for some years was identified with the Wilkoff Bros. Co., Youngstown. S. Walter Platt, formerly Pittsburgh district manager of the Canton Iron & Metal Co., Canton, O., is in charge of the Pittsburgh office of the Cohen-Schwartz company.

Albert Patton, for the past 10 years superintendent of the steel works of the National Tube Co., Lorain, O., has resigned to become connected with the Jones & Laughlin Steel Co., where he will be in charge of the bessemer, open hearth, skelp and two bar mills at the Aliquippa works of the company. Before leaving the National Tube Co., Mr. Patton was presented a handsome mahogany chimes clock by his fellow workers. After a week's rest at Mr. Clemens, he assumed his new duties on Nov. 6. George E. Hitchens, former assistant superintendent under Mr. Patton, will succeed him as superintendent and Fred Alles has been appointed assistant superintendent to succeed Mr. Hitchens.

Wm. B. Hunter, director of the industrial department of the Fitchburg High School, Fitchburg Mass., addressed the regular monthly meeting of the New England Foundrymen's Association at the Exchange club, Boston, Wednesday evening, Nov. 8, on the subject "Co-Operation in Trade Education". Co-operative industrial education has been in use in the Fitchburg High School for some time.

The business hitherto carried on under the name of Joseph Bullows & Co., 65 Long Acre, London, W. C., Eng., has been changed into a private limited company and registered under the style of Alfred H. Mould & Sons, Ltd. Harry W. Mould, who has been associated for many years with his father, Alfred H. Mould, in the business, has become a director.

Water Plant

To Be Built at Lima—Toledo Company Has Paper Mill Contract

Toledo, O., Nov. 6.—The city of Lima, O., is to have a new $550,000 water purification plant, and Wm. G. Clark, Toledo, consulting engineer, with offices in the Spitzer building, has been retained by the Lima director of public service, on the work. Mr. Clark is a man of wide experience in this class of work and was the engineer in charge of the Toledo filtration plant, which cost $3,000,000 and has proven a splendid success. The daily capacity of the Lima plant will be 8,000,000 gallons. The plans call for a pumping station, and a storage reservoir with a capacity for 800,000,000 gallons. The equipment will consist of one 6,000,000-gallon high-service pump, three 4,000,000-gallon low-service pumps, one 500-kilowatt turbo-generator, two 225-horsepower water tube boilers, one 66-inch by 150-foot stack and a low-service pumping station containing 225,000,000 gallons, low-service pumps. The bids on this work will be received some time during December.

The Skeldon Engineering Co., of Toledo, has secured the contract for the engineering work on one of the largest paper mills in the country, which will be erected by the Great Southern Lumber Co., at Bogalousa, La. The plant will have a capacity of 225 tons of finished paper a day. There will be used in the construction of this plant 1,000 tons of structural steel. The plant will be completed and ready for occupation late in 1917.

The Boerder Process Steel Co., Toledo, the only plant in this section which makes a business of refining tungsten ore, reports that inquiries have been received for this product from Russia, France and Sweden. Owing to transportation difficulties, satisfactory prices could not be made and no contract was consummated. The Boerder company uses all of its own product in the manufacture of high-speed steel tools. A process of casting high-speed steel tools has been put into successful operation by this concern, which, the management states, not only reduces prices on these articles, but raises the standard from 35 to 40 per cent. The Toledo Ship Building Co. is now using cast high-speed countersinks with excellent success. They have been given a fair try-out, as they have now been in use for the past eight months and the ship-building company has expressed the intention of using them exclusively in the future. Other ship-building concerns are now trying them.

The Toledo Machine & Tool Co. has completed an addition to its forge shop, which will double its former capacity. Thirty tons of steel were used in the all-steel roof and trusses which support the building. Another building is to be erected by this concern at an early date to be used for pattern storage. This building will be three stories high and the only openings will be two fire doors, one at each end of the building, and a skylight of wire glass. Ninety tons of structural steel will be required.

The Heartley Machine Co. is at work on a beet harvester, which its promoters expect to make a fortune for them. The new machine will be given a try-out in this section when completed. It is a unique invention and considerable interest has been attracted to it among machine men generally.

The McNaull Boiler Mfg. Co. has just delivered to the board of education at Portland, Ore., two 250-horsepower McNaull water-tube boilers for use in the heating plant of the Benson school.

The United States Malleable Iron Works is doing a remarkable business this year and, according to Manager Hagener, has already contracted for more than 50 per cent of the 1917 output of its products.

Federal Judge Killitts has ordered Receiver Walter L. Ross, of the Clover Leaf railroad to purchase 5,000 tons of 80-pound steel rails for the improvement of the tracks of the road. The rails are to be delivered during the year 1917 and the approximate cost will be $150,000.

Will Add to Facilities

Excavations have been started on additions that will be made on the Cleveland and Lorain branches of the American Ship Building Co. A 1-story addition, 60 x 120 feet, will be added to the machine shop in the Cleveland plant. In Lorain, additions of 60 x 120 feet, and 40 x 110 feet, will be made to the forge and boiler shops. It is expected that all three buildings will be ready for occupation by the early part of January.

Gave Liberally

The Worcester, Mass., Y. M. C. A. having raised $376,803.00 in an eight days' financial campaign will proceed at once with the erection of a marble and brick, 7-story, 100 x 150-foot building at 766 Main street in that city, which will be one of the finest of its kind in the United States. Worcester manufacturers, especially those in the iron, steel and metal industry, are responsible for the success of the undertaking, having given sums from $1,000 to $25,000.

Drawback

Is Granted to Encourage Ship Building in Dominion of Canada

Toronto, Nov. 6.—In order to encourage ship building, the Canadian government has passed an order in council granting a 99 per cent drawback of customs duties on articles used in the original construction of ships measuring over 500 tons gross tonnage, built in Canada, to be exported for outside registry.

At a meeting of the directors of the Nova Scotia Steel & Coal Co. at Montreal on Oct. 30 it was decided to build a second ocean-going vessel about 25 per cent larger than the first now under construction. Colonel Cantley, the president, stated that the company had booked orders to capacity up to the middle of 1917 and that business had been offered for the second half of the year, but the company had seen no reason for accepting contracts so far ahead. At the plant of the Eastern Car Co., a subsidiary concern, a drop forgings plant and an electric furnace are in process of installation, which will make the works self-contained in every respect. In addition to foreign business the company is filling an order for 500 50-ton cars for the Transcontinental railway, which will be finished about the end of the year.

The Dominion Steel Corporation is receiving numerous inquiries from American steel companies which are desirous of purchasing supplies of iron ore. Up to the present, the company has never sold any of its ore in the United States.

The International Nickel Co. has completed the survey for its refinery at Port Colborne, Ont., and begun excavation work with a view of having the foundation completed before the winter sets in. If this is accomplished, it is expected that the plant will be in operation within a year. It will be built in units so that it can be quadrupled in capacity should it be found necessary. The first unit will employ 300 men. A number of new technical processes will be introduced. The company has set aside $5,000,000 to cover the cost. The British America Nickel Co. has not as yet definitely decided on a site for its refinery, but it is understood that it is also likely to be located in the Niagara district.

The former site of the Best Mfg. Co., 72 x 400 feet, at Twenty-fifth and the Allegheny Valley railroad, Pittsburgh, has been sold by E. W. Mudge and others to Houseman & Wimmer, scrap iron dealers, Pittsburgh.

Engineers

Will Meet in New York—Many Papers to be Read

A wide range of subjects will be discussed at the thirty-seventh annual meeting of the American Society of Mechanical Engineers, to be held in the Engineering Societies building, New York, Dec. 5 to 8.

Dr. D. S. Jacobus, president, will speak on "The Relation of Education to Engineering", at the opening session and president's reception, Tuesday evening. This will be followed by the introduction of the president-elect. The reception, attended by ladies, guests and members, will be informal.

The business session, followed by the awards of junior and student prizes, and memorial exercises in honor of John E. Sweet, past president, honorary member and founder of the society, will be held Wednesday morning. After these events papers will be presented by George A. Orrok, on "Proportioning of Surface Condensers", by L. P. Breckenridge and D. B. Prentice, on "The Testing of House-Heating Boilers"; and by Arthur C. Scott and J. R. Bailey, on "Water for Steam Boilers—Its Significance and Treatment".

Wednesday afternoon papers will be presented by Arthur D. Pratt, on "The Utilization of Waste Heat for Steam Generating Purposes"; by R. J. S. Pigott, on "Graphic Methods of Analysis in the Design and Operation of Steam Power Plants"; by Victor J. Azbe, on "Power Plant Efficiency"; by Arthur N. Sheldon, on "Heat Transmission Through Various Types of Sash"; and by speakers yet to be named, on textile engineering subjects, and "The Standardization of Machine Tools and Machine Shop Practice." Frank B. Gilbreth will describe his experiences in the European war zone, at the smoker Wednesday evening.

Thursday morning papers will be presented by J. G. Morse, on "Accurate Appraisals by Short Methods"; by H. L. Gantt, on "Productive Capacity a Measure of Value of an Industrial Property"; and by speakers yet to be named, on valuation subjects.

Thursday afternoon will be devoted to papers by O. C. Berry, on "A Gas Producer for Bituminous Coal"; by P. W. Swain, on "Commercial Sampling and Gas Analysis"; by A. A. Potter and W. A. Buck, on "An Investigation of the Internal-Combustion Engine as Applied to Traction Engines"; and by Robert F. Earhart, on "The Ratio of the Specific Heats and the Coefficient of Viscosity of Natural Gas from Typical Fields". Thomas O. Lisle will give an "Illustrated Review of the Workspoor Marine Diesel Engines". The annual reunion and dance will be held Thursday evening, following a lecture yet to be arranged.

Friday morning Sanford A. Moss will deliver a paper on "The Impact Tube"; F. G. Coburn, W. W. Webster and E. L. Patch will discuss "Heat Treatment of Wrought Iron Chain Cable"; Herbert B. Reynolds will read a paper on "The Flow of Air and Steam Through Orifices"; and other papers will be presented on railroad and marine subjects. A public hearing by the boiler code committee will be held Friday afternoon and continue Saturday morning, closing the convention.

Large Extensions

Being Made by Willard Storage Battery Co., Cleveland.

The Willard Storage Battery Co., Cleveland, is engaged in the construction of two new buildings. One of these will be 135 x 220 feet, two stories, and will cost approximately $115,000; the other will be 90 x 240 feet, one story, and will cost $75,000. Both will be of heavy mill construction and will be completed in the early part of 1917. The output of the company is, at the present time, approximately 4,000 storage batteries per day. With the addition of the new buildings, it is estimated that the output will be raised about 75 per cent. The floor space will be increased about 33 per cent.

The addition of these new structures will provide room for the machine shop as well as for other departments now pressed for space. The company will soon be in the market for machinery, machine shop supplies, cranes, gravity conveyors and hoists.

A new power plant, however, is probably the most important improvement that the Willard company plans. The company is in the market for several 1,000 kilowatt generator sets, two 500-kilowatt generator sets, two 500-kilowatt turbines, two 400-horsepower boilers, etc. Much equipment along this line has already been installed.

Besides the above mentioned, considerable other equipment including a complete set of sulphuric acid handling machinery, will be purchased.

The Foster Bolt & Nut Mfg. Co., Cleveland, is erecting a new 2-story brick addition which will about double the floor space of the company.

Coke By-Products

Government Buys Toluol—Spot Benzol Has Weakened

New York, Nov. 7.—The United States government has entered the market as a buyer of toluol and is asking for 150,000 gallons for the best possible delivery during 1917. Other large inquiries are pending and considerable business is being closed. Probably one half of the expected supplies of toluol for next year now are under contract, it is estimated. Prices vary widely. On spot, $3 per gallon still is asked by some sellers, but this has been shaded 50 cents or more. Contracts are around $2. Spot benzol has weakened through heavier resale offerings which have grown as the year-end expiration of 12-month contracts has approached. Some buyers, who for various causes have found they will be unable to use the full amount of their contracts, now are turning sellers. Prices cover a wide spread. Leading first sellers are holding 55 cents as a minimum, but resale lots have gone considerably lower. Buyers are holding off from contracting, expecting lower prices. Sellers are pointing out, however, that considerably more than half of the scheduled output for 1917 already has been taken up, chiefly by European buyers, and that the future market has a good foundation. Contracts are quoted from 55 to 60 cents.

A heavy demand for phenol for export continues. Buyers are bidding slightly under 55 cents per pound, but have trouble to satisfy their demands as the supply is very limited. Moderate sales are being made at 55 cents. Contracts are inactive. Makers would accept some contracts at 50 cents, but the users are not much interested. Solvent naphtha remains weak at 30 cents per gallon for spot and at 25 cents for contract. Active demand for sulphate of ammonia for shipment by the end of March continues and producers are unable to fill it because their outputs, except for small margins, are taken up far ahead. Prices are higher at from $3.86 to $3.88 per 100 pounds at tidewater: Quotations are as follows:

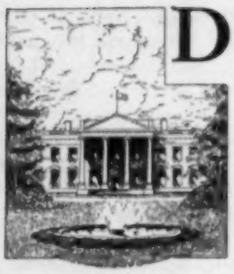
Market Prices for Coke Oven By-Products

Spot.	
Per Gallon at Producers Plant.	
Pure benzol	$0.55
Toluol	2.25 to 3.00
Solvent naphtha	.25 to .30
Per Pound at Producers Plant.	
Phenol	.55
Per 100 Pounds at Seaboard.	
Sulphate of ammonia	$3.86 to 3.88
Contract.	
Per Gallon at Producers Plant.	
Pure benzol	$0.55 to .60
Toluol	2.00 to 2.25
Solvent naphtha	.25
Per Pound at Producers Plant.	
Phenol (nominal)	$0.50
Per 100 Pounds at Seaboard.	
Sulphate of ammonia (nearby)	$3.86 to 3.88

Business News of Nation's Capital

Low Bids on Armor Plate in Spite of High Cost of Material and Labor —Further Legislation May Be Necessary to Expedite Carrying Out the Naval Building Program

Bureau of *The Iron Trade Review*,
206 Corcoran Bldg.,
Nov. 7, 1916



DESPITE the great increase in the cost of labor and material bids for armor plate for four battleships and four battle cruisers which were opened last Wednesday by the bureau of ordnance, navy department, revealed the fact that the prices varied but little when compared with the figures upon which awards for armor were made last year. Secretary of Navy, Josephus Daniels, who almost invariably issues statements after armor bids have been opened attacking the manufacturers, was not in the city last week, and it remains to be seen what attitude he may take toward the latest bids opened. They involved 45,583 tons of armor plate, greatly in excess of any prior tonnage for which the department has ever sought prices.

The requirement for the four battleships involves 41,130 tons of Class A-1 (side armor); 2,312 tons of Class A-2 (turret); 1,780 tons of Class B (special treatment plates); 346.8 tons of Class C-1 (bolts and nuts), and 13.2 tons of Class C-2 (bronze tap bolts). The battleships will require 8,010 tons of armor each and the battle cruisers 3,385 tons each.

The prices and tonnages offered by each of the companies follow:

Bethlehem Steel Co.

Class.	Price per ton.	Not to exceed, tons.
For two battleships:		
A-1	$420.00	14,479.2
A-2	485.00	820.0
B	466.00	602.0
C-1	395.00	116.0
C-2	785.00	4.0
For two battle cruisers:		
A-1	$435.00	6,086.0
A-2	485.00	336.0
B	466.00	288.0
C-1	395.00	57.4
C-2	785.00	2.6

Midvale Steel & Ordnance Co.

For one battleship:		
A-1	$427.00	7,500.0
A-2	496.00	450.0
B	466.00	325.0
C-1	385.00	60.0
C-2	*	
For one battle cruiser:		
A-1	$440.00	3,200.0
A-2	496.00	200.0
B	466.00	150.0
C-1	385.00	30.0
C-2	*	

Carnegie Steel Co.

For two battleships:		
A-1	$425.00	14,479.2
A-2	486.00	820.0
B	460.00	602.0
C-1 and C-2	*	
For one battle cruiser:		
A-1	$425.00	3,043.0
A-2	486.00	168.0
B	460.00	144.0
C-1 and C-2	*	

Pittsburgh Screw & Bolt Co.

C-1	$448.80	346.8
C-2	2,240.00	13.2

It is believed that armor for two battleships and two battle cruisers will be awarded to the Bethlehem Steel Co.; for two battleships and one battle cruiser to the Carnegie Steel Co., and for one battle cruiser to the Midvale Steel & Ordnance Co.

The bid of $420 submitted by the Bethlehem company for Class A-1 armor for two battleships was the lowest offered on this grade which represents 90 per cent of the total tonnage and is $5 less than the price at which awards were made for it last year. This company asked $435 for Class A-1 for two battle cruisers, presumably because a smaller amount of tonnage was involved and also because Class A-1 armor for the cruisers will be only 5 inches thick and will require more machining and forging for the same class of armor for the battleships which will be from 13 to 14 inches thick. The Carnegie company, however, submitted the same figure, $425 per ton, for Class A-1, for both types of vessels. The bid of $485 offered by the Bethlehem company for Class A-2 armor was the lowest submitted on this class, being $1 per ton under the Carnegie bid of $486, at which price awards were made last year for this class of armor. The lowest bid on Class B armor was made by the Carnegie company at $460 per ton, the price at which awards for this class were made last year. The lowest bid on Class C-1 was made by the Midvale company at $385 per ton, comparing with a price of $376 at which awards for this class were made last year.

Ask for Suspension

Washington, Nov. 7.—Protest was made last Thursday before the board of suspension, interstate commerce commission, by interested producers and consumers, asking for the suspension of tariffs filed by railroads in western trunk line territory which cancel prevailing rates on iron and steel products and praying for the substitution therefor of fifth class rates. The tariffs have been filed to become operative on Nov. 15, and it is claimed they would result in increases ranging from 40 to 50 per cent. The tariffs would apply to all points in the territory named, and cover from 75 to 80 iron and steel articles, such as structural and railroad material, wire nails, fencing, etc. E. T. Boyd, tariff agent for the railroads, also gave notice that it was proposed to file tariffs soon making similar increases in the rates on iron and steel pipe to apply from all producing points, some of them to be commodity rates and other fifth class rates.

Among those who protested against the new tariffs was C. L. Lingo, traffic manager for the Inland Steel Co., Chicago. He objected in particular to the proposed increased rates from Chicago and group points to St. Paul, Minneapolis and Duluth. The present commodity rate of 14c per 100 pounds from Chicago to St. Paul and Minneapolis, would be increased to 20c per 100 pounds if the fifth class rates went into effect. Mr. Boyd claimed that the tariffs were designed to equalize the rates between western and eastern producing points, asserting that most of the iron and steel products originating in eastern producing points take the fifth class rating. Protestants, on the other hand, claimed that western points are already discriminated against in favor of Pittsburgh and other prominent points of production in the east.

Carrying Out the Naval Program

Washington, Nov. 7.—Navy department officials are showing considerable concern over bids submitted by private ship builders for vessels for the first year's building program carried in the new naval act. The figures submitted in a number of instances on important units of the program are either in excess of the limit of cost set by congress or carry conditions which cannot be legally considered. This situation, which grows out of the increased costs prevailing in the labor and materials markets, may result in delaying construction of the vessels. Unless the department and ship builders can reach some sort

of an agreement at once for the building of some of the vessels, it may be necessary to enact further legislation by which the limits set for building them will either be increased, or the work will be based upon the cost of construction plus a stipulated profit. This latter plan was adopted by congress with regard to building the four battle cruisers, for which bids will be opened on Dec. 6, but does not apply to any other units carried in the program.

When bids were opened last Wednesday for four scout cruisers, 27 coast defense submarine and two 800-ton seagoing submarines, it developed that the Seattle Construction & Dry Dock Co., Seattle, Wash., was the only builder who submitted a direct figure. It offered to build one scout cruiser for $4,975,000, delivery to be made in 30 months. This price is $25,000 below the cost limit of $5,000,000 set by congress. The bid was based on department specifications, including hull and turbine machinery. Two other yards which offered to build these vessels put their proposals in such form that it seems they cannot be considered. The Union Iron Works, San Francisco, offered to build two scout cruisers upon a basis of the cost of construction plus a profit of 15 per cent. The Fore River Ship Building Corporation, Quincy, Mass., offered to build one or more on the same basis, and in another proposal submitted the same terms it did the previous week as to battleships. They were fixed on a sliding scale governed by the current cost of labor and material, the government to pay any increased costs that might occur, or to receive the benefit of any decreased costs, should they occur. The items of cost would be submitted by the Fore River company to the federal trade commission and the navy department annually. Using the present current prices of labor and material, this company offered to build two scout cruisers, one to be delivered in 33 months and the other in 36 months, for $4,900,000 each, department plans and specifications, including hull and turbine propelling machinery. It is said that the Fore River company's bids on the scout cruisers, as well as its bids on battleships, cannot be considered under the provisions of the naval act as it now stands. The New York Ship Building Co., Camden, N. J., in a letter to the department, said it found it could not come within the limit of cost set on scout cruisers and therefore was unable to bid on them.

The situation with regard to scout cruisers indicates that it will be necessary to readvertise for bids for three of them, provided the Seattle company is given one. But even if it is necessary to readvertise, it would seem the navy department and private builders would have to first come to an understanding before satisfactory offers would be made, or further legislation would have to be enacted by which the cost limit would be increased or the plan of bidding adjusted to accommodate and protect private builders against loss of money on contracts. It has been significantly noticed that the navy yards have not offered any bids on the scout cruisers or battleships, but it is understood the Mare Island, Cal., navy yard has offered to build one or more torpedo boat destroyers. Indications seem to point to the fact that not only because the navy yards are already crowded with work, and perform it slowly, but also because the navy department thinks they would be unable to execute contracts for the bigger vessels, it has been considered wise not to let them do any work on these types of ships.

Bids for the submarines were submitted by the Electric Boat Co., the Lake Torpedo Boat Co., and Schneider & Co., Paris. The latter concern said it could not submit lump sum bids because it had no accurate knowledge as to the cost of American labor and materials. It offered several propositions looking to the leasing to the United States government of designs of submarines it had built for the French government at the Creusot works. The numerous proposals of the two American companies apparently show they were well within the limit of cost set by congress and will be awarded the submarine contracts.

Provided awards for the four battleships and 20 torpedo boat destroyers are made upon the basis of bids which have been submitted, it seems to be the opinion that the former will be divided between the New York Ship Building Co. and the Newport News Ship Building & Dry Dock Co., Newport News, Va. Three of the torpedo boat destroyers may, it is said, be given to the navy yards, two to William Cramp & Sons Ship & Engine Building Co., Philadelphia, eight to the Fore River Ship Building Corporation, and three to the Union Iron Works.

Recent reports state that the merchant mill of the Pittsburgh Crucible Steel Co., Midland, Pa., broke all its previous records Oct. 26 by rolling 543 tons of high carbon steel rounds in 12 hours. During this period the sections were changed three times. The actual rolling time was 11 hours and 30 minutes. During this record, there were times when 199 billets were rolled in one hour, and the turn was finished by making an average of 175-5/12 billets per hour. P. J. Mundie, superintendent of the above mill, is a man of wide experience and has had marked success during his associations with the Crucible company.

Foreign Trades Council Meeting

The annual convention of the National Foreign Trades Council will be held at Pittsburgh, Jan. 25, 26 and 27, 1917. J. Rogers Flannery, J. J. Nordman, E. M. Herr, Col. H. P. Bope, F. F. Nicola and W. S. Linderman have been appointed members of the local executive committee in charge of the meeting. James A. Farrell, president of the United States Steel Corporation; Samuel P. Colt, president, the United States Rubber Co.; P. A. S. Franklin, president, the International Mercantile Marine Co.; Fairfax Harrison, president, the Southern Railway Co.; Louis W. Hill, president, the Great Northern Railway Co.; A. B. Johnson, president, the Baldwin Locomotive Works; Cyrus H. McCormick, president, the International Harvester Co.; John D. Ryan, president, the Amalgamated Copper Co.; Willard Straight, president, the American International Corporation; Frank A. Vanderlip, president, the National City Bank of New York, and J. N. Willys, president, the Willys-Overland Co., will be among those who take a prominent part in the meeting.

Will Build Blast Furnace

Chicago, Nov. 6.—The Iroquois Iron Co. is planning further extensions for its plant at South Chicago. Construction shortly will be commenced on a fifth blast furnace stack and probably a sixth, within a short time after. The plans also include extensive alterations on "A" furnace, to bring its capacity to 300 tons per day. This stack is now operated by the Miami Products Co. on ferro-manganese. Within the next six or eight months the changes in "A" furnace will be completed together with one of the new stacks. In case of unexpected good fortune in obtaining material both new stacks may be in operation during the latter part of next year. Work is being carried forward rapidly on the mixer and converter to be used in the production of bessemer ingots for sale in the open market.

Iron and Money: Fact and Comment

Crucible Steel Co. Reports Earnings of 52 Per Cent on Common Stock —Explains Conservative Disposition of Profits Against Future Trade Reaction

"WE BELIEVE in the recognition of the need of tempering hopefulness with good judgment and therefore believe it wisest to treat our present prosperity and the prospective good year in 1917 with great conservatism."

This is part of the official message to stockholders which accompanies the report of the Crucible Steel Co. of America for the year ended Aug. 31. It outlines briefly the policy of all steel companies, from the Steel Corporation down to the smallest steel producer. All have indicated their attitude by their careful disposition of earnings, for shareholders have not participated in profits to any considerable extent.

Crucible's report shows earnings of 52 per cent on the $25,000,000 common stock, after allowing regular preferred dividends. Net profits amounted to $13,223,655, which were disposed of as follows: Dividends, $2,125,000; increase in current assets, $10,060,288; additional property, $1,038,866.

The income account for the year ended Aug. 31, compares as follows:

	1916.	1915.
Gross profits	$16,528,748	$5,220,921
Deprec. and renewals.	1,915,240	1,464,616
Interest on scrip	595,282	634,112
Contingencies	794,570	48,443
Total charges	3,305,092	2,147,171
Net profits	13,223,655	3,073,750

There was appropriated from the surplus for property and working capital the sum of $15,000,000, leaving the unappropriated surplus $6,543,605.

The Crucible Steel Co. has done little to wipe out the score of back dividends accrued on the preferred stock. Only 8½ per cent was disbursed on this account in the past year and the company still has 23¼ per cent outstanding. Chairman Herbert DuPuy explains the company's position as follows:

"The argument is that present profits, after paying debts, should be first utilized to place the company in an impregnable position against the inevitable reaction to follow the settlement of the European war. To meet these future conditions, your officials realize the need of making large expenditures in its plants to maintain an economic position in competition with other manufacturing concerns, both at home and abroad.

"Putting back into property the large sums of money already spent and to be spent, will not only accomplish this, but will cut operating costs to a level where competition can be fairly met. These expenditures must necessarily be taken out of profits."

While much interest has been taken in the election for weeks past, the stock market has reflected little of this feeling. Despite the issues which were believed to be hanging in the balance, steel shares were strong on all exchanges and several made new high records. United States Steel climbed to a new high of 123¼ Monday. Quotations on a number of iron, steel and industrial shares at the close of trading on the New York stock exchange Nov. 4 and net changes for the preceding week are shown in the following table:

American Can	63⅝	+1¾
American Can, prfd.	113½	+ ⅜
Amer. Car & Fdy.	69½	+2⅛
Amer. Car & Fdy., prfd.	118½	— ⅜
American Locomotive	90¾	+8⅜
American Locomotive, prfd.	108½	+1½
American Steel Foundries	64	+1⅜
Baldwin Locomotive	87⅛	+3⅜
Baldwin Locomotive, prfd.	106½	.....
Bethlehem Steel	678	+28
Bethlehem Steel, prfd.	150	.....
Colorado Fuel & Iron	53¼	— ½
Continental Can	103⅞	+ ⅞
Continental Can, prfd.	.....	.....
Crucible Steel	92⅛	+4½
Crucible Steel, prfd.	122½	+ ½
General Electric	182	+ ¾
Gulf States Steel	95	—1
Gulf States Steel, 1st prfd.	101	+1
Gulf States Steel, 2d prfd.	96	+ ½
Internat'l Harv. of N. J.	117½	— ½
Inter. Harv. of N. J., prfd.	120	.....
International Harv. Corp.	.....	.....
Internat'l Harv. Corp., prfd.	.....	.....
Lackawanna Steel	89	— ⅛
Nat'l En. & Stamp. Co.	32¼	+4¼
Nat'l En. & Stmp. Co., prf.	97¼	+1¾
Pressed Steel Car	74	+2
Pressed Steel Car, prfd.	104	— ¼
Pullman Palace Car	168	—2⅛
Republic Iron & Steel	77¾	— ⅛
Republic Iron & Steel, prfd.	114½	+1
U. S. C. I. P. & Fdy. Co.	25⅜	—1⅛
U. S. C. I. P. & F. Co., pr.	65	+4½
United States Steel	120⅜	+1
United States Steel, prfd.	122⅜	+1¼
Westinghouse Mfg. Co.	65⅝	+2

Carbon Steel Earnings

The Carbon Steel Co., Pittsburgh, has just issued its twenty-second annual report, for the fiscal year ended Oct. 1. The report shows net profits of $3,099,610 after payment of all expenses, interest on bonds, collateral trust notes and bills payable of the company and a special bonus to employes. The balance available for dividends equaled 80 per cent on the $3,000,000 common stock, after all allowances, expenses and preferred dividends. The surplus as of Oct. 1, 1915, having been $132,687, the last year's profits brought the total surplus to $3,100,947, as of Oct. 1, 1916, including sundry adjustments.

President Charles McKnight remarks to stockholders that "at the time of annual meeting last year, you were informed that the business of your company was in satisfactory condition, but that no practical results had been as yet received, as several large contracts had not been finished. It is gratifying to report that the estimates made by your officers have been confirmed, both as to the profits realized on regular domestic business and special contracts for war munitions and materials."

Evidence of the successful results from the contracts President McKnight mentions is found in plenty in the statement. On Sept. 20 directors of the company declared dividends on the second preferred and common stock on the latter for the first time in more than 10 years. Six per cent was disbursed on each issue Sept. 30. In addition, a

Following is the condensed balance sheet as of Sept. 30, 1916:

CONDENSED BALANCE SHEET.

As at Sept. 30, 1916.

Assets—		
Real estate, plant, equip. & goodwill.		$6,344,411.91
Accts. and bills rec.	$ 502,640.03	
Invent. at cost	1,178,207.83	
Deferred charges	24,854.48	
Investments	5,000.00	
Cash	1,005,073.48	2,715,775.82
		$9,060,187.73
Liabilities—		
Cap. stk—First prfd.	$500,000.00	
Second prfd.	1,500,000.00	
Common	3,000,000.00	$5,000,000.00
1st and 2nd mort. bonds outstanding (Carbon Iron Co.)	602,000.00	
20-yr. 5 per cent S. F. gold bonds outstanding (Carbon Steel Co.)	342,000.00	
Mort. on Hill prop.	160,000.00	1,104,000.00
Accts. payable	404,230.30	
Accrued interest	10,500.00	
Sundry reserves	144,183.94	558,914.24
Surplus		2,397,273.49
		$9,060,187.73

John F. and Horace Dodge, stockholders in the Ford Motor Co., Detroit, have obtained a temporary injunction in circuit court at Detroit, restraining Henry Ford from using the assets of

the Ford company to extend the business as planned, instead of distributing profits in dividends. The Dodge brothers allege that increased labor costs and unstable business conditions following the war make "reckless expenditures of the company's assets unwise."

Financial Crop Ends

The Buffalo Steam Roller Co., Buffalo, and the Kelly-Springfield Road Roller Co., Springfield, O., are to be consolidated. The new firm will be known as the Buffalo-Springfield Roller Co. The main plant will be in Springfield. Rollers of all types, weighing from two and one-half tons to 20 tons, will be made.

* * *

The Charcoal Iron Co. of America reports profits from operations for quarter Sept. 30, $336,415, after deducting all expenses. A net profit of $301,905 is carried to surplus after deducting $10,511 for interest on borrowed money and $24,000 for extinguishing of construction costs on new acetone plants. The net profits for the preceding six months were $529,884.

* * *

The Scovill Mfg. Co., Waterbury, Conn., has declared an extra dividend of 10 per cent, payable Nov. 1, making the seventh successive month in which it has declared an extra dividend for the same amount. Extra dividends paid so far this year amount to 93 per cent, and with the three regular quarterly payments of 2 per cent each, bring the total dividend payments this year up to 99 per cent.

* * *

The capital stock of the A. O. Smith Co., Milwaukee, maker of automobile parts, will be increased from $1,000,000 to $3,000,000 preferred and an additional 100,000 common shares with no par value. The company's business has outgrown its capitalization. No change will be made in the company's name or its officers. L. R. Smith continues president, general manager and chief stockholder.

* * *

The new board of directors of the Transue & Williams Steel Forging Corporation, which was recently formed with a capitalization of 100,000 shares to take over the Transue & Williams Co., Alliance, O., is comprised of the following: O. F. Transue, president; Frank Transue, vice president; F. E. Dussel, secretary and treasurer; W. H. Transue; Harry R. Jones, president of the United Alloy Steel Corporation; C. E. Farnsworth, of the First National Bank of Cleveland, and John W. Prentiss, of Hornblower & Weeks. The Transue & Williams has been closely allied as a customer with the United Steel Co., Canton, O., now the United Alloy Steel, and the appearance of Harry R. Jones on the Transue board is taken to indicate that this close relationship will continue. The Cleveland banking interests are represented by Mr. Farnsworth.

* * *

The United Motors Corporation, Detroit, has purchased the Harrison Mfg. Co., Lockport, N. Y. The Harrison company manufactures radiators. The same policy will be followed with this company as with regard to the other concerns with the United Motors has taken over. The purchase of the Harrison Mfg. Co. brings the total United Motors purchases up to eight companies, these being the Hyatt, New Departure, Delco, Remy, Perlman, Klaxon, Brown-Line-Chapin and Harrison.

* * *

The Chalmers Motor Corporation, Detroit, successor of the company of the same name, will have an authorized capital issue of 600,000 shares without par value, of which about 135,000 will remain in the treasury. For the present stock of the Chalmers Motor Co. of Michigan 200,000 shares will be exchanged, and the 265,000 shares remaining will be offered for subscription at $35. The company manufactures about 25,000 cars a year and plans to increase this to 30,000 next season.

* * *

Formal notice is given by the Youngstown Sheet & Tube Co., Youngstown, O., that on Jan. 1 next it will retire all of its outstanding bonds. There are outstanding $1,250,000 first and collateral trust 6s dated July 1, 1905, and $455,000 Struthers Plant serial 6s. As all are thus to be retired before their due dates, the company must pay 105 for them. That will mean a distribution of more than $1,790,000. Payment will be made through the Dollar Savings & Trust Co., Youngstown.

* * *

The By-Products Coke Corporation, Chicago, has sent notice to stockholders announcing issuance of $1,308,825 capital stock of stockholders at par, on a basis of one share for every share now owned. The company has an authorized capitalization of $10,000,000, of which $5,235,500 is outstanding. The stock to be issued will bring the outstanding capital up to $6,544,125. The money to be raised by the new stock will be used as additional working capital and to provide funds for extensions to plant and property.

* * *

The Brier Hill Steel Co., Youngstown, O., will retire all of its outstanding bonds at the next interest period, which falls on Feb. 1, 1917. President W. A. Thomas announces that this action was decided upon at a meeting of directors recently. Payment of these bonds will clear away all obligations of the kind against the company. The funded debt outstanding of the Brier Hill Steel Co. on July 1, 1916, was $2,051,000 first mortgage gold 6 per cent bonds, dated Feb. 1, 1915, due $200,000 annually from Feb. 1, 1917 to Feb. 1, 1926, inclusive. The large profits of the company the past year have enabled it to retire the whole issue on the date of the first interest period.

* * *

The Semet-Solvay Co., Syracuse, N. Y., has purchased approximately 7,300 acres of coal lands in Tuscaloosa county, Ala., from the Alabama Co., Birmingham, at a price said to be approximately $500,000. The option on the coal lands had been held by the Semet-Solvay Co. for a considerable period.

The coal lands purchased are in the vicinity of the Semet-Solvay plant at Ensley, Ala. This is one of the company's largest coke oven plants, 240 ovens being in operation. Heretofore, the Ensley plant has been supplied with coal from mines other than those owned by the company. This is the company's first purchase of coal lands in the south.

By-Product Plant

Will Eventually be Built at Wharton —Lands Not Included

The 7,500 acres of coal and coke land and 300 beehive ovens in Indiana county, Pa., formerly owned by the Wharton Steel Co., are not included in the recent sale of the properties of this company to J. L. Replogle and associates. These coal lands recently were sold by the Wharton interests to other parties. The coke end of the Wharton blast furnaces at Wharton, N. J., will be taken care of eventually by a by-product plant. The owners have completed an examination of the property and this has shown that two of the blast furnaces are in first class condition and will require only a moderate amount of rehabilitation work. These furnaces probably will be put in shape to be run as merchant producers pending the working out of the ultimate plans for a steel works at Wharton which, as yet, are not formulated.

The New Jersey Zinc Co. is completing preparations to resume the mining of zinc ore at Friedensville, Lehigh county, Pa. The mines in this vicinity many years ago were an important source of supply.

News of Employers and Employes

Congress of Human Engineering Held at Ohio State University Discusses Important Questions—Personal Interest a Factor in Overcoming Socialistic Tendencies

THE importance of problems arising from the human element in industry, the way the employers and industrial workers are to meet the problems were topics considered in addresses given before sessions of the congress of human engineering at Ohio State University, Columbus, Oct. 28-30. Engineers, professors, college presidents and members of religious and labor organizations were in attendance.

The congress was called to add an impetus to a movement to bring about a closer understanding between engineers and the men who work for them. The engineering college of the university was instrumental in securing the congress for Columbus and the original conception was that of Prof. Demorest of the chair of metallurgy. President William Oxley Thompson, of Ohio State, presided at all the sessions. All students in the engineering college were required to attend.

"I believe that the man who best interests the genius of the people is the engineer," said Dr. D. G. Mitchell, president of Delaware College, Newark, Del. "I present Col. Goethals to you as the typical man. Industry in this country is surging as never before. We have never known such a tidal wave of prosperity, but along this wave of prosperity there is a restlessness of labor that we have not experienced before. The crisis was only illustrated in the railroad strike. And a knowledge of this restlessness is one reason for the timeliness of this congress.

"There is a changing mind in the relation of capital and labor, and some of the results of this changing mind are shorter hours, better sanitation in plants, housing problems and corporation schools, where the working men are instructed. There are many things for the student to do when he comes to the place where he will have the power, such as providing decent eating halls, and encouraging the aspirations of the working men, learning to treat them as brothers."

C. R. Dooley, manager of the educational department of the Westinghouse Electric & Mfg. Co. took for his topic, "The Opportunities and Requirements of the Engineering Profession." He remarked that technic was only a minor part of the requirement of the college graduate when looking for a job. The time is past, said he, when the large industrial concerns are looking for the mechanically perfect man.

"The test of a man is, if he can do a new job right the first time," continued Mr. Dooley. "Anybody can do it after he is shown how, but it takes a man with some intellect to be able to figure out a method.

"I would not advise a man to take engineering because his brother made good at it. If a man does not like it so much that he would rather hang around some large industrial plant than eat, he is not fit for the business.

"The man who never has any responsibility never gets very far. He has no initiative. The man who works his way through school is carrying a load. The man who does that work with his intellect is the man who gets on in the world."

That the liberty of the laborer could only be maintained by insistence upon his right to sell his labor at his own price and be free in selecting employment was the statement of Captain William P. White, U. S. N., retired, and general manager of the Lowell Paper Tuber Corporation. He attacked an eight-hour law as an economic disaster.

C. R. Hook, vice president of the American Rolling Mills Co., Middletown, O., operation division, spoke on "Human Engineering in the Steel Mills." He said that the "safety-first" movement was a study of the human element in industry and the psychology of the workingman determines to a great degree the results of the safety campaigns. In handling industrial problems, said Mr. Hook, the investigator must first study the home conditions of the employes before he comes to the shops. He criticized students for being intemperate and said that if they undertook industry with the idea that they could succeed with intemperance, promotion would be slow in coming.

Socialistic Tendencies

When asked as to what he thought were the best methods to use to overcome the socialistic tendencies of the men, Mr. Hook said: "Use a personal interest in the men. Try to understand them and the things which affect them. Do not do these things in a paternalizing way, but in a brotherly way."

Peter Roberts, of the Industrial Department of the international committee of the Y. M. C. A., discussed in detail his method of teaching English to foreigners. C. J. Hicks, executive assistant to the president of the Colorado Fuel & Iron Co., told of the extent his company has gone toward getting into closer touch with the employes.

"We have adopted the industrial representation plan," said Mr. Hicks. "We post lists containing the names of employe's representatives. Whenever an employe has a grievance against the company, he consults the representative in his division who in turn takes up the case with one of our executives appointed especially for this work. No employe is dismissed without cause. We make no discrimination against employes on account of membership in any fraternal or labor organizations. Meetings of employes are held on the company's property. We have Y. M. C. A. buildings, garages and dwellings erected for the employes' benefit. You would be surprised to know how many miners own their own machines."

The Y. M. C. A's part in human engineering work was explained by Charles R. Towson, New York. He told in detail of the work done by this organization's representatives in establishing classes for foreigners, furnishing directors and secretaries for the building erected by the different companies and of general uplift work.

"You don't get 70 per cent efficiency out of working men who have not proper homes or who do not get proper sleep or nourishment," he said.

"The Handling of Men" was the topic discussed by W. A. Grieves, secretary of the Jeffrey Mfg. Co., Columbus. "Human engineering is an agency that has come into being as a result of demands made for the improvement of industrial conditions," said Mr. Grieves. "It is a part of the crusade for the advancement of ideals of the people engaged in our great army of industry. It is an honest desire on the part of the better element in our industrial life to emphasize the slogan that, 'Industry is for humanity and not humanity for industry.

"One of our biggest manufacturers has made the statement that there are three fundamental elements entering into the makeup of industry—men, money and machines. He has said there was little difficulty getting money; that it was not hard to get machines, but that it was a tremendous task to get men. In our 12 years experience in handling men we are convinced that, while it is difficult to get good men, the manufacturer did not go far enough. He should have added: 'It is still a greater problem to keep men after you have hired them.

Handling Men

"Forty concerns were asked about their experience in hiring employes but only 20 could furnish definite data. The investigation revealed the fact that to maintain an average force of 44,000 men in these 20 concerns for the previous year, 70,000 were hired.

"There is no reason why any business concern can not put the question of handling men and their welfare on a business basis and frankly state the business reason for such undertaking.

"When employes have learned that capital and labor are inter-independent—that both must prosper on the same basis—a good beginning will have been made. They will learn that demagogues and agitators do not fill envelopes, and never will. They will learn that co-operation and not disintegration is the evident need. Men with red blood in their veins only want an opportunity to help themselves, and any good system that overlooks this part must pay the penalty of oversight."

Expressing his sincere hope that Ohio State University would, sooner or later, give its students the advantage of a course in human engineering, Joseph W. Roe, professor of mechanical engineering of Yale University, spoke on "The College Man and Human Engineering." His advice to students was to find their natural tendencies and follow that line.

"While a college graduate is getting a foothold upon his profession he should get to know the workman and get in sympathy with him," said Prof. Roe. "This is the first step to success."

He stated that the greatest efficiency is reached under reasonable hours, ideal working conditions and good wages. "The engineer stands between capital and labor and knows the want of each," he continued. "He should be the mediator and do his best to promote efficiency."

In the opinion of John A. Voll, president of the Ohio Federation of Labor, many strikes could have been averted if the wage-earners had only been treated as human beings. He said he was heart and soul in sympathy with the human engineering movement. John P. Frey, editor of the *International Molders' Journal*, spoke along the same lines.

L. T. Warner, of Warner Bros. Co., Bridgeport, Conn., said: "The outline of a course of lectures on the human side of engineering impresses me as possessing great interest and promise. The subject is one which has aroused the interest and enthusiasm of many engineers and without doubt the colleges may do well to undertake some work in this field."

Others who spoke at the congress were Edwin L. Shuey, director, advertising department, the Lowe Bros. Co., Dayton; Willard Beahan, engineer, for the New York Central Railroad, Cleveland; Fred Rindge Jr., industrial department of the international committee of the Y. M. C. A., and Horace B. Drury, department of economics and sociology of Ohio State University.

A display illustrating what has been done by some corporations in industrial betterment was on exhibition in the main corridor of the library from 8 o'clock in the morning until 5 o'clock in the afternoon each day.

Opposed to Eight Hours

John W. Higgins, treasurer and general manager of the Worcester Pressed Steel Co., Worcester, Mass., spoke recently before the Massachusetts special commission on social insurance, in opposition to the proposed legislation restricting hours of employment in industries operating continually, to eight hours per day. He referred to the competition with western manufacturers, saying Massachusetts is not naturally well situated. He said that if freight rates are raised because of the passage of the Adamson law, as now seems likely, it will be even more difficult for Massachusetts plants to continue operation. The eight-hour day, he said, has not proved a success in metal manufactories. It has been tried in Bridgeport, Conn., and surely no Massachusetts workmen would change places with those employed in that city. "It is a fine slogan, but is not a sound industrial principle", he said.

Texas Metal Trades

At the recent annual meeting of the Texas Metal Trades Association held at Dallas, the delegates devoted considerable time to a discussion of industrial preparedness as a means of benefitting that state and the country at large. Educational conditions from the standpoint of equipping young men for life work along industrial lines were considered in its various phases. It was the sense of the meeting that the present public school system of Texas and the whole country is entirely inadequate to the needs of the masses of young men who desire to enter industrial pursuits and become proficient in the different trades. The association adopted a resolution favoring the establishment of trade schools by the state in different localities. It is apparent, according to the views of the delegates, that the world is entering upon a mechanical era and that Texas should prepare for its share of this character of industrial development. The meeting was presided over by President J. H. Holmgreen of San Antonia. Secretary L. J. Black, of Beaumont, was unable to attend.

Strike in New England

The most serious labor trouble in New England the past week was at the Lensdale plant of the American Optical Co., Southbridge, Mass., 852 employes walking out the morning of Nov. 1 because their demands of an increase of 20 cents on the dollar in pay and time and a half for overtime work was denied. As a result of the strike, about 2,800 men were thrown out of work, as the strikers are in a department that does all the preliminary work required before the product could be handled by the other employes. The men who are mostly foreigners have been receiving from 15 to 30 cents an hour. Fearing violence, the police force of the town has been doubled and assistance sent from the Worcester, Mass., Police.

Labor Notes

The Draper Co., Hopedale, Mass., maker of textile machinery, has voted to increase the wages of its 2,500 employes in all departments "in view of the increased cost of living". The amount of the advance has not been made public.

The employes of the General Electric Co., Pittsfield, Mass., have voted by the Australian ballot system to work 50 hours a week, and this will go into effect at once, according to the company. The 50-hour week will mean that pieceworkers will have to work harder to make the same wages they made working 52½ hours, and the day workers will receive practically the same pay for 50 hours that they received for 52½. The increase of 5 per cent granted Oct. 1 is now in effect.

Ship Yards Pound Market for Tools

Pressure is Felt in Many Sections as Contracts for Vessels Are Placed—Demands of Munition Plants Have Been Temporarily Satisfied—Heavy Mill Equipment Still Sought in Pittsburgh

ALTHOUGH the machine tool market now is not characterized by as huge a bulk of business as was reported a week ago, the condition which prevails continues to be one of marked activity. Some of the business last week reported as pending, has been closed and other prospective purchases are expected to materialize shortly. The largest business now being entered is comprised of the requirements of a ship building concern just organized to build a 6-berth ship yard at Seattle, Wash. This concern is the Ames Ship Building & Drydock Co., of which Edgar Ames, vice president of the State Bank of Seattle, is president. The equipment has practically all been placed, and involves a huge expenditure. This company already has obtained contracts to build a number of vessels. The Standard Ship Building Corporation, 44 Whitehall street, New York, is negotiating actively on the large list of equipment on which it recently inquired, but it is expected that it will be at least two weeks before any action will be taken. In some quarters it is considered as not at all certain that the company will buy the equipment involved. The Texas Steamship Co., Bath, Me., has purchased additional equipment, including several punching and shearing machines, a ship building tower crane and a traveler. The Newport News Ship Building & Drydock Co., Newport News, Va., and the New York Ship Building Co., Camden, N. J., each have recently bought equipment. The Lake Torpedo Boat Co., Bridgeport, Conn., has put out a request for bids on a large list of machine tools. The Southern railroad has enlarged its pending list by a few tools. The General Electric Co. is purchasing considerable machine tool equipment but it has not yet acted on the large lists for its Fort Wayne, Ind., plant, and for the proposed new plant at Bloomfield, N. J. The Union Twist Drill Co., Athol, Mass., recently bought considerable equipment. Other business, made up mostly of small orders, continues to swell the total to large proportions. The crane market is fairly active, and is featured by an inquiry for several cranes for a large eastern concern which is expected to purchase shortly.

The Billings & Spencer Co., Hartford, Conn., is about to erect a large addition. The New England Drawn Steel Co., recently organized, is starting the erection of a plant at Mansfield, Mass. The Autocar Co., Ardmore, Pa., is about to build a repair shop addition. The Bridgeport Projectile Co., Bridgeport, Conn., has let a contract for the construction of a large gun shop. The Torsion Balance Co., Jersey City, N. J., is extending its machine shop capacity. The Oxweld Acetylene Co., Newark, N. J., has let a contract for a brass foundry. William Cramp & Sons Ship & Engine Building Co., Philadelphia, is about to erect two new shop additions. The Peerless Marine Motor Co., Buffalo, is about to erect an addition. Titanium Alloy Mfg. Co., Niagara Falls, N. Y., is about to erect five new buildings. The Norwich Wire Basket Co., Norwich, N. Y., has let a contract for the erection of a large addition. The Hilliard Clutch & Machine Co., Elmira, N. Y., is planning to build a new machine shop. The Specialty Nail Co., Raynham, Mass., is erecting an addition. The Bell Motor Car Co., York, Pa., plans to erect a plant. The Ranier Motor Truck Corporation, Fifty-fifth street and Broadway, New York, has let a contract for a plant at Flushing, Long Island. The Transmission Ball Bearing Co., recently organized, plans to build a plant in Buffalo.

Deferred Deliveries Halt Chicago Market

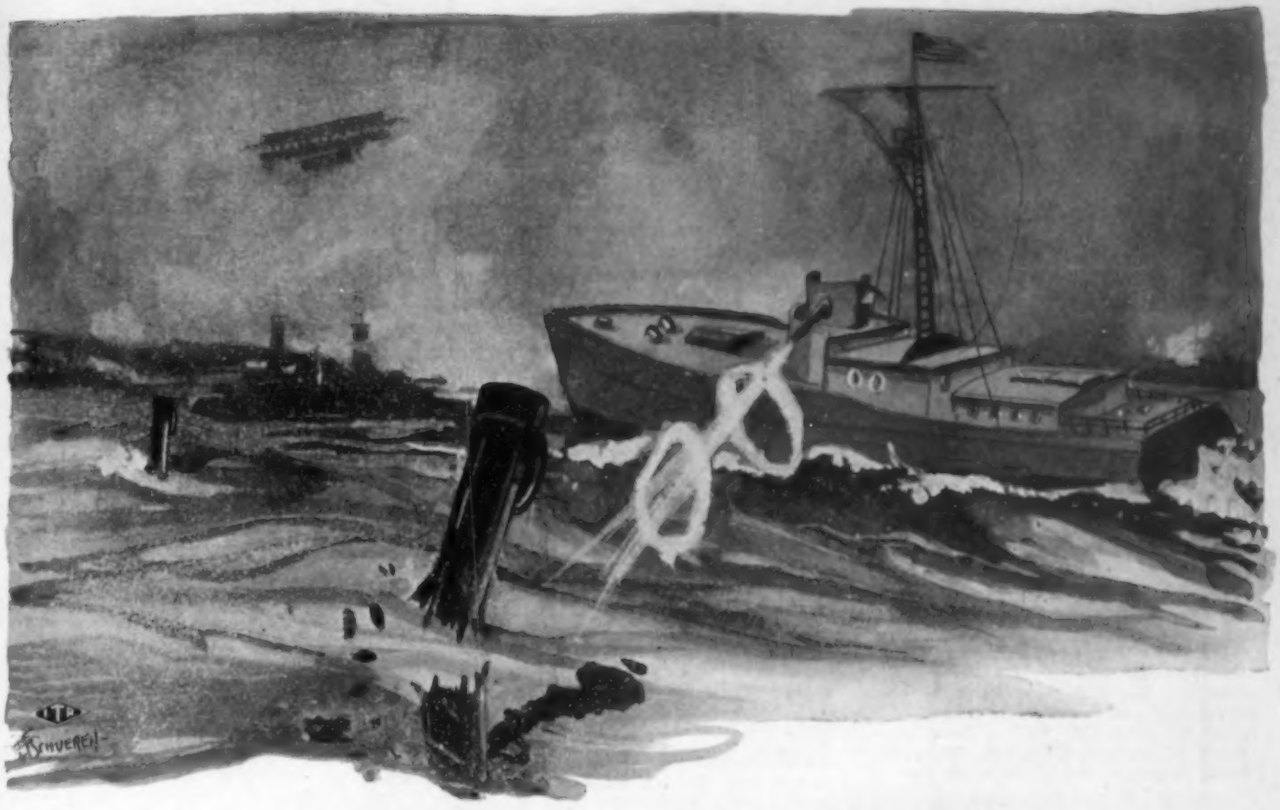
A NUMBER of good foreign inquiries have appeared from time to time in the Chicago machine tool market, but few contracts have been closed. This lack of business is no doubt due to the fact that very few dealers have a large assortment of machines in stock. A recent sale of 11 24-inch lathes for a foreign government followed by another order for 18 22-inch machines from the same buyer is evidence that if deliveries could be made promptly, considerable business might be placed. Machine shop equipment for the manufacture of small shells is in demand and it is believed that a considerable number of small shell turning lathes will be purchased by munition manufacturers before January. Delivery may be obtained about Feb. 1 on all standard machines with the exception of milling machines and grinders.

Heavy Mill Equipment Being Sought in Pittsburgh Territory

A HEAVY demand for rolling mill and machine shop equipment continues to feature the market at Pittsburgh. The Youngstown Sheet & Tube Co., Youngstown, O., which has awarded contracts for an extension to its open-hearth steel plant, is negotiating for 14 electric traveling cranes, including one 175-ton and two 100-ton ladle cranes, charging and stripping machines and standard lifting equipment. The railroads are taking a more prominent part in the market. The Pittsburgh & Lake Erie has closed for two large shears and several punches for its shop at Struthers, O., and the Pennsylvania Lines West has awarded contracts for a miscellaneous line of machine and boiler shop equipment for plants at Pittsburgh and Columbus, O. The Westinghouse Machine Co. has distributed orders for about 50 tools, which were listed in *The Iron Trade Review* several weeks ago. The Carnegie Steel Co. has not yet closed for a number of punches and shears for its by-product coke oven works at Clairton, Pa. The Union Electric Steel Co. is equipping a plant at Carnegie, Pa., for the manufacture of steel by the electric furnace process.

Cincinnati Market Dull

AS AN example of deliveries given by Cincinnati machine tool plants, a local user of milling machines states that an order placed four months ago, was received this week. It is also stated that better deliveries could not be had from any plant at the time the order was placed. A few local builders of milling machines can make shipments within two or three weeks but the majority of plants building this type of tool are still booked two or three months ahead. The English government has an inquiry out



It takes small, speedy, reliable boats to GET the Submarine

The huge, mighty battleships, built to defend our coasts, must depend upon *small, speedy, reliable boats* for protection from treacherous, hostile submarines.

These small "submarine killers" must have powerful, always dependable engines—engines that will not break down under terrific strains.

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Chicago Office: Room 1511-12 Lytton Bldg., 14 East Jackson Blvd., A. Schaeffer, District Representative

Cleveland Office: Hickox Bldg., The Hamill-Hickox Co., District Representative

Philadelphia Office: 902 Widener Bldg., Frank Wallace, District Representative

J. E. Dockendorff & Co., 20 Broad St., New York, N. Y., General Export Agents

for 100 boring machines of various sizes with the stipulation that a delivery clause must accompany all bids. Second-hand machinery is moving well and dealers state they are not experiencing much difficulty in selling good second-hand tools. The railroads are still taking single tools at a time, but are buying more frequently.

Ship Yards Keep Cleveland Builders Busy

DELIVERIES on milling machines, cylindrical grinders and radial drills continue to lag but it is stated that shipments on other machines are becoming more normal. The Cleveland market is devoid of any spectacular buying but there are some good inquiries out among the dealers. The American Ship Building Co., Cleveland, is in the market for equipment for its plant at Lorain, O., as well as for the local yards. The list which has been issued includes the following machines: Forging presses, lathes, drill presses, planers and several cranes including jib cranes and one 10-ton crane with 100-foot span. The Toledo Ship Building Co., Toledo, O., is in the market for a 4-foot radial drill. The Morgan Engineering Co., Alliance, O., is said to be still in the market for equipment. The Wahlstrom Tool Co., Brooklyn, N. Y., is inquiring for two milling machines, numbers two and three, of any of the following makes, Becker, Brown & Sharpe, Cincinnati, Cleveland, Kearney & Trecker, Le Blonde, Oesterlein or Kempsmith. The Transmission Ball Bearing Co., 32 Wells street, Buffalo, is erecting a large addition and is in the market for turret lathes, hardening furnaces, grinders and milling machines. It is said that a Pittsburgh concern now manufacturing munitions shortly will place about $275,000 worth of tools on the market.

Among New England Factories

PORTLAND, ME. — The Pocahontas Fuel Co., Boston, will build a 750-foot wharf and coal hoisting tower at Long wharf.

PORTLAND, ME. — The Stanley Steel Wheel Co. has been incorporated to manufacture steel and wire wheels with $750,000 capital by Arthur M. Stanley, Lynn, Mass., Warren K. Blodgett, Cambridge, Mass., Scott Wilson, Eugene L. Bodge and E. M. Dyer.

ANTRIM, N. H.—The Antrim-Bennington Electric Light & Power Co. has been incorporated with $150,000 capital by Louis N. Wheelock, Joseph C. Bogue, Paul H. Hammond, Boston, Ivan L. Meloon and Margaret A. O'Connor, Concord, N. H.

EVERETT, N. H. — The Boston Varnish Co. has awarded a contract for a brick and concrete, 3-story, 95 x 115-foot addition to its office and storehouse at Boston and East Summer streets to cost $35,000.

CAMBRIDGE, MASS. — The Advance Machine Co., Boston, has leased the property at 37 Osborn street, until recently occupied by the Alberti Box Co., and it will use the first and second floors for the manufacture of special embossing machines.

FITCHBURG, MASS.—The Falulah Paper Co. will build a brick, 1-story and basement, 70 x 141-foot addition to its plant on Falulah road, South Fitchburgh.

NEW BEDFORD, MASS. — The Turner Construction Co., New York, has been awarded the contract for a reinforced concrete, 1-story, 140 x 239-foot building for the Butler mill.

WORCESTER, MASS.—The Washburn & Garfield Mfg. Co. will build a brick, 3-story and basement, 61 x 99-foot light manufacturing building to cost $60,000 at Commercial and North Foster streets.

WORCESTER, MASS.—The Leland-Gifford Co., manufacturer of crankshafts, drills, etc., has awarded contract for a brick, mill construction, 4-story, 62 x 102-foot with a wing of the same material and height, 62 x 124-foot addition to its plant at 1025 Southbridge street, to cost $75,000.

MELVILLE, R. I.—Twenty-two contractors are figuring plans for the corrugated steel, fireproof superstructure for a torpedo storage building to cost $25,000 at the naval coaling station, for the United States navy department. Bids close Nov. 13.

PAWTUCKET, R. I.—The Dexter Yarn Co. is building a brick, 4-story and basement, 40 x 120-foot addition.

PROVIDENCE, R. I. — The Providence Telephone Co. has awarded a contract to the C. B. Maguire Co. for a marble and brick, 8-story building at Washington, Greene and Walnut streets.

PROVIDENCE, R. I.—The United States Electric Generator Co. has been incorporated to manufacture electric batteries, generators and other similar equipment with $200,000 capital by Arthur P. Manchester, Eli A. Wilcox and Harry M. Spooner, Cranston, R. I.

BRIDGEPORT, CONN.—The Electric Cable Co. will build a brick, mill construction, 4-story, 13 x 58-foot addition to its factory.

MIDDLETOWN, CONN.—The New England Enameling Co. has awarded contract for a brick factory building.

MIDDLETOWN, CONN.—The J. O. Smith Mfg. Co. has awarded contract for a brick, 3-story, 26 x 52-foot addition to its factory in Westfield, Conn.

ROCKVILLE, CONN.—Bids close Nov. 21 for a brick and stone, 1-story and basement, 56 x 78-foot post office building to cost $55,000 at Park and School streets.

WATERBURY, CONN. — The American Fastener Co. will build a brick, 4-story, 40 x 98-foot with an ell 25 x 60-foot factory at Maple street and Maple avenue.

From the Alleghenies to the Sea

AUBURN, N. Y.—Dunn & McCarthy have let contract for 3-story, 30 x 196-foot manufacturing building.

BROOKLYN. — The Turner Construction Co., 11 Broadway, New York, is about to build 3-story, 70 x 70-foot shop building here, which it will use for its own purposes.

LONG ISLAND CITY, L. I.—The Globe Thread Co., 147 Spring street, New York, shortly will erect 3-story, 100 x 200-foot factory and power plant here.

JAMESTOWN, N. Y.—The Dahlstrom Metallic Door Co. has let contract for L-shaped manufacturing building, 1-story, 40 x 120 and 100 x 100-foot.

NEW YORK.—Architect Wm. Higginson, 13 Park Row, New York, is drawing plans for 6-story, 25 x 42 x 100-foot factory building to be built at cost of about $60,000 for Lehmaier, Schwartz & Co.

NIAGARA FALLS, N. Y.—The National Carbon Co. has let contract to the Snyder-Gillett Construction Co., Niagara Falls, for 1-story, 135 x 300-foot manufacturing building.

ROCHESTER, N. Y.—Atlantic Stamping Co., 180 Ames street, has let contract for three additions, each 1-story, 16 x 30-foot.

UTICA, N. Y.—Utica Gas & Electric Co. is about to erect addition to its gas plant.

ARLINGTON, N. J.—The Standard Tool & Mfg. Co. has been incorporated to construct machinery, docks, buildings, gas, electric, telephone plants, etc., with a capital of $25,000, by John Stranberg, Bernard Keating, Arlington, and Frank Roach, Newark.

BOUND BROOK, N. J.—The Commercial Acetylene Railway Light & Signal Co. has let contract for the erection of 1-story, 50 x 75-foot manufacturing addition.

BRIDGETON, N. J.—The board of education will erect a new school to cost $150,000.

ELIZABETH, N. J. — The Elizabethtown Gas Light Co. will erect a 1-story brick and concrete boiler house at Third and Florida streets.

JERSEY CITY, N. J.—The Joseph Dixon Crucible Co. has let contract for 4-story and basement, 25 x 50-foot brass building.

JERSEY CITY, N. J.—James Spence, 921 Garfield avenue, has let contract for 1-story, 45 x 60-foot foundry addition.

MILLVILLE, N. J.—The Aberthaw Contracting Co., Boston, has been awarded a contract for a 1 and 2-story, with basement, reinforced concrete plant, 240 x 237, for the Millville Mfg. Co.

NEWARK, N. J.—John Campbell & Co., 75 Hudson street, New York, have let con-

Convention Reflections of

ROLLING MILL JIM

Well, fellows, it was good to be out in St. Louis to see the Judge, Charlie and the rest of the Big boys having a good time and acting just as sociable as the rest of us common fellows. I never had much of a chance to get away from the mill until the last year, so didn't know before how human our Big men really are until I met some of them and saw all of them. Feel too good to talk shop.

So long—

Rolling Mill Jim.—

Hubbard Steel Foundry Co.

EAST CHICAGO, IND.

All Kinds of Iron and Steel Rolls and Steel Castings.

tract for 1-story, 70 x 100-foot manufacturing building here.

NEWARK, N. J. — The Wright Chemical Co. has been incorporated to manufacture chemicals with $100,000 capital by Ezra J. Wright, Anna G. Wright, Anna C. Crocker, Brooklyn.

NEWARK, N. J.—The Reuter Puncture-Proof Tire & Tube Co. has been incorporated to manufacture and deal in tubes and tires with a $125,000 capital by Alfred Strauss, George J. Reuter, Lewis R. Freund, Newark, and A. M. Herman, Pleasantdale.

NEWARK, N. J.—The Celluloid Co. has awarded a contract to the Stone & Webster Engineering Co. for several factory buildings to be added to its present plant at 290 Ferry street. The group of buildings will cost about $1,000,000.

NEWARK, N. J.—The American Synthetic Dyes Co. will erect three additional buildings in connection with its new plant along Passaic river; structures to include storage platform, 42 x 204 feet; 1-story brick pumping station, 24 x 39, and auxiliary boiler house, 20 x 30, to cost $9,500.

NEW BRUNSWICK, N. J. — Adam W. Smith, owner of the Nelson Brass & Iron Foundry Co. has filed a petition in bankruptcy in the United States district court.

PASSAIC, N. J.—The Botany Worsted Mill Co. will erect a new plant to cost $250,000.

PATERSON, N. J.—The Paterson Development Co. will erect a new 4-story building, 75 x 275 feet, to cost $200,000.

SOUTH AMBOY, N. J.—The board of education will have plans drawn for a new school to cost $150,000.

UNION HILL, N. J.—The Gibson Mon-Auto Co. has been incorporated to deal in self-propelling vehicles with $1,000,000 capital by Hugo C. Gibson, Abram Wyse, New York City, and Robert Kumpa, Union Hill.

GREENSBURG, PA.—The DuPont Powder Co. has erected a branch plant on the Hempfield Branch railroad.

HARRISBURG, PA.—No. 2 Paxton rolling mill of the Central Iron & Steel Co. was damaged to the extent of several thousand dollars by a fire in the electrical department.

PHILADELPHIA.—The Philadelphia Enamel Mfg. Co. is having plans drawn by H. H. Kline, architect, Sixth and Mifflin streets, Philadelphia, for 1-story, 120 x 200-foot manufacturing structure.

PHILADELPHIA. — Frankford arsenal is about to extend its lead shop.

PHILADELPHIA. — The Germantown Tool Works has let contract for 1-story, 50 x 98-foot shop.

PHILADELPHIA. — Sutton & Stephenson have taken out a permit to erect a 1-story machine shop 60 x 110 feet, for the Hess Machine Works.

PHILADELPHIA.—J. C. McElroy, Thirtieth and Chestnut streets, has let contract to N. Enoch, 842 South Alden street, for a 1-story, 50 x 144-foot foundry.

PHILADELPHIA. — The Church Lane Garage Co. is having plans drawn by Folsom & Stanton, architects, 1328 Walnut street, for a 1 and 2-story, 76 x 110-foot machine shop and garage.

READING, PA. — Edwin A. Moore Iron Foundry is erecting 30 x 60 x 120-foot foundry addition. This will increase the output of gray iron castings by about 50 per cent.

Activities in the Central States

AKRON, O.—The Chatelain Machine Co. has been incorporated with $75,000 capital and will build a plant early in the spring.

AKRON, O.—The Punctureless Auto Tire Co., E. S. Scheck, counsel, shortly will hold a meeting to vote on a proposal to increase the capital stock to provide funds for extension purposes.

BELLEFONTAINE, O.—The chamber of commerce will start an automobile factory in Bellefontaine, to manufacture pleasure cars.

CANAL DOVER, O.—The Cleveland Steel Valve Co. has an option on property in Canal Dover. The paid up stock of the company is $80,000.

CLEVELAND.—The McLaren Iron Works Co. has taken a permit to erect a $15,000 manufacturing building at 1725 Urbana road.

CLEVELAND. — The Goedecke Specialty Mfg. Co. has been incorporated with $50,000 by M. G. McAleenan, B. E. Robertson, M. C. Myers, et al.

CLEVELAND. — The Jordan Motor Co., East 152nd street, is negotiating for a large addition to its plant, the addition to double the present factory space.

CLEVELAND. — The American Steel & Wire Co. plans to erect a $75,000 factory building on Lakeside near Marquette avenue, to be used for making fine wire.

CLEVELAND.—Architect H. T. Jefferies has prepared plans for a 2-story addition to cost $150,000 to the Union building, 1836 Euclid avenue.

CLEVELAND.—The Cleveland Auto Parts Co. has been incorporated with $100,000 capital, by M. T. Evans, J. F. Lennert, Henry F. Koch, et al.

CLEVELAND.—The E. A. Schwarzenberg Co. has been incorporated with $200,000 capital to deal in metals, by E. A. Schwarzenberg, Walter Lucas, Max Pressler, et al.

CLEVELAND.—The Standard Signal Tail Light Co. has been incorporated with $50,000 capital, to manufacture vehicle signals, by A. A. Stambaugh, S. C. Elliott, T. A. Lind et al.

CLEVELAND. — The Republic Structural Iron Works Co. has purchased the plant on East Fifty-third street, formerly occupied by the Avery Co. and will equip it for manufacturing reinforcing bars.

CLEVELAND.—The National Carbon Co. has purchased 61⅓ acres, opposite the company's present plant, which is to be developed soon with a group of factory buildings costing over $500,000.

CLEVELAND. — The Firestone Tire & Rubber Co., Akron, has purchased a site at 3076 Prospect avenue on which it will erect a branch and service station to cost about $100,000.

CLEVELAND. — The Abbott Corporation has applied for a building permit to construct a $110,000 automobile manufacturing plant at 1131 East 152nd street covering a ground space of 110 x 680 feet.

CLEVELAND.—The Cleveland Galvanizing Works Co. has purchased land on Cooper avenue to be developed by a series of factory units each having a definite relation to the group plan. The first will be 60 x 335 feet and will be equipped with automatic shutes and pockets for receiving and distributing raw material. The company makes weldless wire chain products.

DAYTON, O. — The Dayton Screw Co. will open a plant in the Brenner building on North Webb street. Address W. P. Anderson.

DAYTON, O.—Howard Gau, inventor of a powderless shell, announces that he has interested W. P. Chapman & Co. in his invention. They contemplate the erection of a $50,000 plant.

DAYTON, O.—J. S. Kerrins, supervising engineer of the Dayton Power & Light Co., states that the construction of the power plant which the company will erect will be completed Nov. 1, 1917. The plans call for two steel stacks, 16 feet, diameter and 325 feet high. The first installation of boilers include three 1,500-horsepower units.

LIMA, O.—The Lima Hollow Brick Co. has been incorporated with $150,000 capital by C. M. Cable, W. H. Willis and J. L. Cable.

LIMA, O.—The Pandoro Overall Mfg. Co.'s factory near Lima was damaged by fire entailing a loss of $60,000. E. Welty, 1700 West High street, treasurer of the company, states that a new plant will be erected in this city and that the factory now located in Zanesville will be moved here.

LORAIN, O.—The National Tube Co. is planning extensive improvements to its docking equipment for the unloading of ore. It is stated that two new unloading machines will be installed.

MARSHVILLE, O.—The Bauer Mfg. Co. has been incorporated with $25,000 capital to manufacture ladders, by T. H. Smith, C. A. Weiser, F. W. Eckard, et al.

MIDDLETOWN, O. — The Colin-Gardner Paper Co. is constructing a new power plant at its mill on West Third street to cost $200,000. New warehouses also are planned. Coal conveyors will be installed and steam turbines and dynamos also will be added.

VERMILLION, O.—W. E. Decker, president of the Dall Motor Parts Co., announces the contract for the company's new building has been awarded and that the building will be ready for machinery by Jan. 15. The company will manufacture pistons for automobiles.

WARREN, O.—A. E. Mace, manager of the Trumbull Mazda lamp division of the General Electric Co., states that the contract for the $75,000 addition to its plant has been awarded to Heller Bros., Youngstown. Equipment costing $25,000 will be installed.

FAIRMOUNT, IND.—The Bell Mfg. Co. has been incorporated to manufacture metal and woodworking machinery with $50,000 capital stock by J. W. Joseph, Henry Abrams and William J. Henly Jr.

FORT WAYNE, IND.—The Anthony Auto Lifter Co. has been incorporated with $10,000 capital. Directors are C. O. Blee, W. O. Chaney and G. F. Seymour.

INDIANAPOLIS. — The Kramm Foundry Co. has been incorporated with $50,000 capital, by H. D. Kramm, W. S. Wilson and C. B. Mock.

INDIANAPOLIS.—The Atkins Mfg. Co. has been incorporated to manufacture heating devices, with $50,000 capital by A. O. Atkins, Leslie Genung and D. W. Atkins.

MARION, IND.—The Marion Metal Products Co. has been incorporated with $50,000 capital, to manufacture machinery. Directors

Blackwood Steels

The operation of our immense, new steel foundry is now in full swing.

Our large capacity and ideal facilities enable us to give you highest quality work and prompt delivery.

We are specializing the manufacture of

CASE HARDENING BOXES
and
LEAD AND CYANIDE POTS

which we are making of specially prepared steel.

SPECIFY BLACKWOOD

SUPERFINE STEEL CASTINGS

FOR

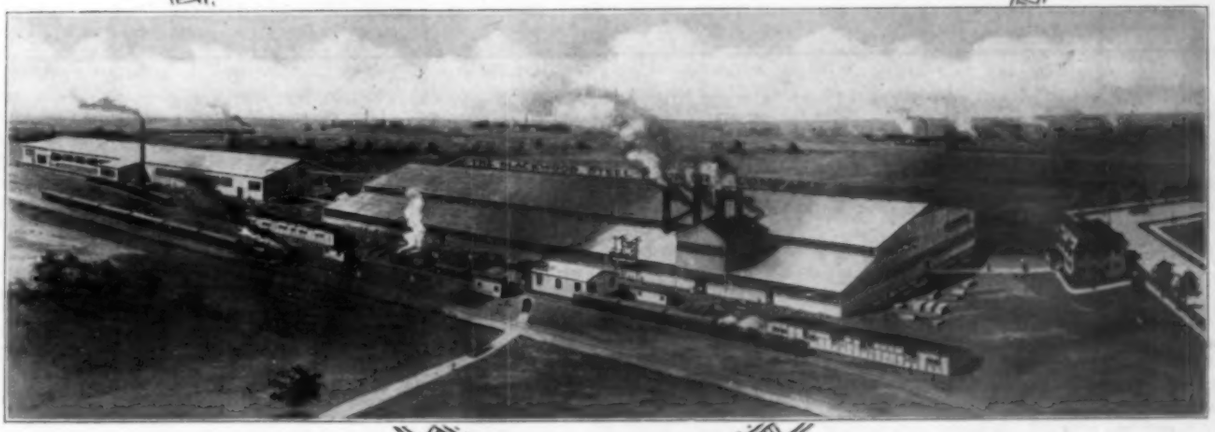
Automobiles, Auto Trucks and High Grade Machinery

We also make **ELECTRICAL CASTINGS** of the highest Magnetic Permeability and **CASTINGS** made of **SPECIAL ALLOYS.**

WRITE US

The Blackwood Steel Foundry Co.

SPRINGFIELD, OHIO



are William Shideler, W. E. Plummer and C. A. Williams.

MONTPELIER, IND. — The property of the Jackson Shovel & Tool Co. will be sold by Charles H. Morse, receiver, on Nov. 10.

RICHMOND, IND.—The Swayne-Robinson Mfg. Co. has announced plans for building a foundry that will increase the company's working force by 150 men.

WASHINGTON, IND.—Bids will be received until Nov. 9 by J. G. Clark, county auditor, for several bridges of 75, 34, 30, 70 and 60-foot span.

CHICAGO.—The Western Screw Mfg. Co. has increased its capital stock from $10,000 to $20,000.

CHICAGO.—H. C. Evans & Co., 75 W. Vanburen street, will build a 2-story factory

square feet floor space. The company's old plant at Third and Larned streets has been sold to the Pennsylvania railroad for $480,000.

DETROIT.—The John A. Crowley Steel Co., 1222 Ford building, is erecting a new steel smelter to produce high grade alloy steel. Electric furnaces will be installed.

DETROIT.—The Disco Electric Starter Co. will erect a new factory which will enable it to triple its present output. The building will be 2-story, 78 x 185 feet.

DETROIT.—The Detroit Motor Lock Co. has been incorporated with $30,000 capital, to manufacture automobile parts, by C. R. Kerns, George M. Conner and R. M. Muir.

DETROIT.—Buhl Sons & Co., wholesale hardware dealers, are having plans prepared

H. A. Flagg and Frank Kritz, all formerly with the Standard Welding Co., of Cleveland.

HOWELL, MICH. — The Howell Electric Motors Co. has increased its capital to $100,000 and is preparing plans for an addition 40 x 100 feet.

HURLEY, MICH.—The Morgan Co. will erect a coal, sand, cement and rock handling plant, on a site next to the Soo Line railroad, facing on Suffolk street. Screening and gravity systems will be installed.

OWOSSO, MICH.—The Standard Machine Co., J. C. Fetter and J. A. Bradford, Bay City, Mich., owners, will erect a plant at Sputh and Washington streets. A machine shop 40 x 120 feet and a foundry 50 x 80 feet will be erected.

WHITE HALL, MICH.—The White Lake

Business Changes, Consolidations and Expansions

The American Cabinet Mfg. Co., Chicago, will establish a branch plant at New Albany, Ind. It is reported eventually the entire plant will be moved from Chicago.

* * *

The Maysville Machine & Iron Works, Maysville, Ky., has been purchased by William Roth and John Greeley, Covington, Ky.

* * *

The Connecticut Brass Co., Cheshire, Conn., has changed its corporate name to the George J. Lines Brass Co.

* * *

The Raybestos Co., Bridgeport, Conn., which was incorporated recently, has taken over the factory of the Royal Equipment Co., Hancock avenue, and its plant on East Main street, Stratford, Conn.

* * *

A. M. Wood & Co., Philadelphia, iron and steel dealers, have moved into larger quarters at 305-307 Commercial Trust building.

* * *

The Cisco Machine Tool Co., Cincinnati, has increased its capital from $50,000 to $100,000. The company recently has finished an 80 x 120-foot addition and has installed a large amount of new equipment.

The Thwing Instrument Co., 445 North Fifth street, Philadelphia, manufacturer of high resistance multiple record pyrometers, has been forced by increased business to change its location. The new plant of the company is located at 3339-41 Lancaster avenue.

* * *

The Simmons Co., Kenosha, Wis., will use the former Chicago plant of the Allis-Chalmers Co., which it purchased recently, as a warehouse for general storage of raw and finished materials. The building is 264 x 338 feet, four stories, and was purchased for $213,000. The building later may be equipped for making metal beds and springs.

* * *

The Standard Machine & Foundry Co., Schlesingerville, Wis., has been purchased by Milwaukee capitalists, among whom is Robert La Point. Mr. La Point has taken full charge as president and general manager of the company, the name of which has been changed to the La Point Foundry Co. Mr. La Point previously was connected with the International Harvester Co., Milwaukee.

* * *

The New London Ship & Engine Co., Groton, Conn., has notified its 1,500 employes that hereafter it will pay them time and a half for all overtime work, Saturday afternoons being included in over time periods.

to cost $40,000, and will install electrical motors and other equipment.

CHICAGO.—The Metal Specialties Mfg. Co., 730 W. Monroe street, manufacturer of automobile accessories, will build a 4-story factory building at Kedzie & Carroll avenues at a cost of $100,000.

FISHER, ILL.—Bids will be asked soon for the construction of a waterworks system. J. E. Pickens, Kankakee, is engineer.

PEORIA, ILL.—The W. N. Springer Experimental Machinery Co. has been incorporated with $5,000 capital stock by W. N. Springer, Asa Wallace and Guy Shaw.

WILMETTE, ILL.—The village trustees are considering plans for a municipal waterworks plant to cost $150,000, by D. H. Maury, a Chicago engineer.

DETROIT. — The Buhl Stamping Co. will erect a new plant on a 7-acre site recently purchased at Scotten avenue and the Michigan Central railroad, which will have 150,000

for a new warehouse to be erected along the Detroit river front near Walke street. The new building will front 480 feet on the river and will have a depth of 220 feet. A new dock also will be built.

ESCANABA, MICH.—The proposition of holding a special election to vote on a bond issue of $400,000 to provide Escanaba with a complete new waterworks and sewerage system is now before the common council.

GRAND RAPIDS, MICH.—The Michigan Wheel Co. has issued $50,000 preferred stock to finance extensive improvements.

GRAND RAPIDS, MICH. — The Plank Flexible Shaft Machine Co. is planning to reorganize with $200,000 capital, to manufacture a new automobile shaft. R. R. Plank is president and general manager of the company. Extensions to the plant are planned.

HAMTRAMCK, MICH. — The Michigan Steel Tube Products Co. has been incorporated with $300,000 capital, by C. E. Miller,

Machine Co. has been incorporated with $20,000 capital, to manufacture machinery, by George Margrave, Gustaf Moovie, et al.

BERLIN, WIS.—The Waverly Garage has been purchased by A. Wilson & Sons, who will build an addition and enlarge all facilities. A separate repair shop with electric motor drive will be provided.

EAU CLAIRE, WIS. — Owing to labor troubles in tire machinery manufacturing plants at Akron, O., the Gillette Safety Tire Co. is having further difficulty in getting delivery of the $30,000 worth of equipment purchased for its new plant at Eau Claire nearly a year ago. Shipments are now promised beginning Nov. 4 or 6 and it is hoped to open the tire factory by Dec. 1, as buildings have been ready for several months. R. B. Gillette is president and general manager.

DULUTH.—The Superior Specialty Co. has been incorporated with $50,000 capital to manufacture heat regulating devices, by A. G. Hatch, B. R. Altman and J. E. Gardner.

New Trade Publications

MULTIVANE FANS.—A new line of multivane fans, known as design No. 3, is considered in a 100-page catalog recently issued by the B. F. Sturtevant Co., Hyde Park, Mass. This line of fans has been developed to provide fans which will have a large outlet area for a given maintained resistance. To accomplish this the proportions of the casing have been changed. Dimensions, capacities, horsepower, etc., for fans having different discharge openings are included.

SOOT CLEANER.—The Vulcan Soot Cleaner Co., Du Bois, Pa., has issued a new pamphlet which attacks the question of soot and the advisability of using cleaners in a scientific manner. The booklet is divided into six chapters which start with an explanation of soot and its sources, tells why clean heating surfaces are advisable and conclude with a description of various methods of cleaning. The text includes considerable technical data and a number of illustrations.

ELECTRIC HOISTS.—The Sprague Electric Works of the General Electric Co., New York, has published a catalog describing its ½ and 1-ton electric hoists and the many applications for which they are suited. In addition to a description of the various parts of the hoist and their individual functions, a detailed drawing is included to show the size and space occupied by the different types. The hoists are built to operate on either alternating or direct current.

MOLDING MACHINES.—The Vulcan Engineering Sales Co., recently published a 12-page bulletin on molding machines, manufactured by the Mumford Molding Machine Co., Chicago, giving particular attention to the Mumford squeezers. Many types of squeezers are described, it being the particular object of the bulletin to show how these machines effect economy of labor and promote greater efficiency. Jolt ramming and pattern drawing machines are also described, as well as numerous pneumatic vibrators and valves.

DIES AND TAPS.—The Greenfield Tap & Die Corporation, Greenfield, Mass., is distributing a catalog describing and illustrating the Greenfield products. The booklet is divided into sections devoted to screw plates, dies, reamers, pipe tools, threading machines, gages and to miscellaneous tables of information. Countersinks, die-holders, collets, tap chucks, steel rods, stocks, micrometers, etc., are also described and illustrated. The catalog is 270 pages in length and contains an alphabetically arranged index.

GEARS AND PINIONS.—A 24-page bulletin on the subject of railway motor gears and pinions has been published by the General Electric Co., Schenectady, N. Y. Many types of cast and forged gears are illustrated and a view of the gear cutting equipment of the plant is shown. The gears and pinions are described not only as to bore, finish, lining wear, etc., but also as to physical and chemical characteristics. A considerable portion of the catalog is given over to a discussion of gear and pinion teeth.

AIR COMPRESSORS.—The Chicago Pneumatic Tool Co., Chicago, has issued a 24-page bulletin on fuel oil-driven compressors. The compressors are designed to utilize low grade fuel oils, thus effecting greater economy. It is claimed that the compressors will operate successfully on crude oil, residuum, stove oil, star oil, calol, diesol, solar oil, gas oil, coal oil and kerosene. The compressor is described in detail and many types are illustrated. A page is devoted to a partial list of users of pneumatic compressors.

VALVES.—The Scully Steel & Iron Co., Chicago, has ready for distribution a new booklet describing its line of valves. The new catalog is illustrated with views of installations where the valves are used. The design and principle of the valves are shown in section and phantom views. These valves are built in a variety of sizes and may be used for any service requiring a quick opening and closing valve. For special service, such as in acid lines, the valves are made of alloys designed to withstand deterioration.

TRUCKS AND TURNTABLES. — The Whiting Foundry Equipment Co., Harvey, Ill., has published a 16-page bulletin devoted to trucks and turntables. The trucks are designed especially for heavy shop work. They are fitted with chilled cast-iron wheels, steel axles, and steel frames with steel or wooden tops. Steel roller bearings are used. Many special kinds of trucks including dump cars, core oven cars, special heavy drying oven cars, electric transfer cars, etc., are described. Several types of turntables including plain faced, single and double tracked are illustrated.

DRY PANS.—The Stevenson Co., Wellsville, O., has issued an attractive 88-page booklet describing and illustrating wet and dry pans and clay working machinery. The company was founded in 1896 and a picture of the first plant, a rambling frame structure which has long been superseded by a modern steel building, is shown in the catalog. The Stevenson company manufactures wet and dry pans, sewer pipe presses, tile presses, clay elevators for wet and dry clay, clay conveyors, trucks, friction clutch pulleys, brick machines, automatic cutters, pug mills, crushers, etc. Pulleys of various sizes are described.

FORGES AND FURNACES.—Tate, Jones & Co., Pittsburgh, recently issued two folders describing forges and furnaces for light forging and blacksmith work. The one devoted to tool-dressing furnaces and blacksmith forges, shows how tool dressing furnaces may be adapted to light forging work. In furnaces of this type, several pieces can be heated at one time, so that at least one piece is always ready for the operator when he needs it. The forges and furnaces may use either oil or gas fuel. Bolt-heading and rod-heating furnaces are described and illustrated in the second folder. Standard sizes of this equipment are listed.

HEATERS.—A comprehensive catalog containing 136 pages, issued by the B. F. Sturtevant Co., Hyde Park, Mass., is devoted to the heating system which bears this company's name. The first part of the book describes the operation, construction and mechanical details of Sturtevant heaters and is intended for those who are not buying this class of apparatus regularly. The latter part of the catalog, which gives performance tables, diagrams and dimensions, is for the benefit of engineers, architects and steamfitters and will enable them to chose the heater necessary for any given building. Diagrams showing proper methods of making steam connections and the space occupied by the heaters also are included.

ELECTRIC FANS.—A 60-page catalog issued by the B. F. Sturtevant Co., Hyde Park, Mass., is devoted to motor-driven fans built by this company. The fans described include centrifugal, propeller and disc types. The centrifugal fans are installed to supply fresh air or air under pressure and to remove foul air. The propeller fans exhaust foul air from rooms, halls or similarly enclosed spaces, but will not deliver air against much resistance and therefore they will not operate to advantage in connection with long piping or ducts. The disc fans are used for the same classes of service as the propeller fan. A large amount of data are included covering pressures, volumes, sizes, etc., to guide in the selection of a small fan for any specific purpose.

COAL HANDLING SYSTEM.—"Handling Coal in the Victor Power Plant," is the subject of a 16-page booklet issued by the Link-Belt Co., Philadelphia. The coal is brought to the plant at Camden, N. J., in barges on the Delaware river and is unloaded by means of a locomotive crane equipped with a grab bucket. The coal is deposited in a weighing car and then dumped at a convenient spot in the storage yard. As the fuel is needed in the power house, it is taken from the storage yard and dropped into a track hopper which feeds it to a crusher. The crushed coal falls upon a bucket conveyor, is elevated to the top of the boiler room, and is dumped into a V-shaped bin. The lower part of the bin is equipped with cutoff gates to control the flow of coal into a traveling weighing hopper, which when filled, is moved to a position in front of one of the stokers. The cutoff gate is then opened and the coal is delivered to the magazine of the stoker through a chute. The ashes collect in hoppers at the rear of the boilers and are dumped into hand cars, then elevated and dumped into railroad cars by means of a skip hoist.

VANADIUM STEEL.—The American Vanadium Co., Pittsburgh, Pa., has issued an 80-page booklet covering the subject of vanadium describing the qualities of vanadium steels in a comprehensive manner. In a historical introduction it is stated that vanadium was first discovered in 1801, but that little experimenting was done with it until the present century. The alloying of vanadium with nickel, iron, silicon, manganese, and the manner in which it will unite with carbon and the various gases is clearly described. Its characteristics are compared with those of nickel and nickel-chrome. The manner in which heat treatment affects vanadium is illustrated with micro-photographs. Several heat treatments of chrome-vanadium steels are described as well as the best case hardening processes that the American Vanadium Co., has available. Much space is given over to descriptions of the various types of vanadium-steel alloys together with their tensile strengths and elastic limits. The method of making the alloys is described in the latter part of the booklet. Vanadium steel is used extensively in making armature shafts, armor plate, steel castings and forgings for locomotives, automobiles, hydraulic cylinders, cam shafts, various high speed steels, etc.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Lower price to July 1, 1917; higher to Jan. 1, 1918.)

Bessemer valley	$28.00
Bessemer, Pittsburgh	28.95
Basic, Pittsburgh	23.95 to 24.45
Basic, eastern Pa.	25.00 to 25.50
Basic, Buffalo	25.00 to 26.00
Malleable, Pittsburgh	25.00 to 26.00
Malleable foundry, Chicago	24.00 to 25.00
Malleable foundry, Philadelphia	23.00 to 23.50
Malleable foundry, Buffalo	25.00 to 26.00
No. 1X foundry, Philadelphia	23.00 to 23.50
No. 2 foundry, Pittsburgh	25.00 to 26.00
No. 2 foundry, Cleveland	24.30 to 25.30
No. 2 foundry, Ironton	23.00
No. 2 foundry, Chicago	24.00 to 25.00
No. 2X foundry, Philadelphia	23.50 to 24.00
No. 2X foundry, N. J. tidewater	23.50 to 24.00
No. 2X foundry, Buffalo	25.00 to 26.00
No. 2 plain, Philadelphia	22.00 to 22.50
No. 2 plain, N. J. tidewater	22.00 to 22.50
No. 2 plain, Buffalo	25.00 to 26.00
No. 2 southern, Birmingham	20.00
No. 2 southern, Cleveland	21.00 to 21.50
No. 2 southern, Chicago	22.50
No. 2 southern, Phila. delivery	20.00 to 20.75
No. 2 southern, Cleveland	24.00
No. 2 southern, New York docks	20.00 to 20.50
No. 2 southern, Boston docks	20.25 to 20.75
No. 2 south. interior, New Eng.	20.50 to 21.50
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X furnace	22.00 to 23.00
Virginia, No. 2X, Philadelphia	22.75 to 23.25
Virginia, No. 2X, Jersey City	23.00 to 23.50
Virginia 2X, Boston points	23.25 to 23.75
Gray forge, eastern Pa.	20.00 to 20.50
Gray forge, Pittsburgh	24.95
Gray forge, Birmingham	14.00
Silveries, 8 per cent, furnace	30.00
Silveries, 8 per cent, Chicago	29.50 to 30.50
Low phos. Standard, Phila.	43.00 to 45.00
Low phos. Lebanon, Pa., furnace	35.00 to 37.00
Low phos., Pittsburgh	40.00 to 41.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	20.75 to 22.75
Charcoal, Buffalo	24.00 to 27.00
Charcoal, Birmingham	22.50 to 23.00

IRON ORE

Lake Superior Ores.
(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bes., 51½ per cent, ton.	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.
(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit	8.5c to 8.9c
Local N. Y. and N. J. ores, unit	9.0c to 9.50c
Port Henry lump, at mines, ton.	$4.00

Foreign Ores.
(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	nominal
For'n non-Bess., 50 to 65 per cent	nominal

COKE

(At the ovens.)

Connellsville furnace	$7.50 to 8.00
Connellsville fur., contract	3.75 to 4.00
Connellsville foundry, contract	5.00 to 5.50
Connellsville foundry	8.00 to 8.25
Wise county furnace, contract	4.50 to 5.50
Wise county foundry, contract	5.50 to 6.50
Pocahontas foundry, contract	5.50 to 6.50
Pocahontas furnace, contract	4.50 to 5.50
New River foundry, contract	6.00 to 7.00
New River furnace, contract	5.00 to 6.00

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, seaboard, or delivered prompt.	$162 to 165
Ferro manganese, 80 per cent, seaboard, or delivered, contract	162 to 165
Spiegel, 20 per cent, fur. early and last half	40.00 to 45.00
Ferro-silicon, 50 per cent, Pbg.	95.00 to 100.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $34.00; 10 to 11 per cent, $35.00; 11 to 12 per cent, $36.00; 12 to 13 per cent, $37.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$50.00 to 55.00
Forging billets, Phila.	65.00 to 70.00
Forging billets, Pbgh., nominal.	70.00 to 80.00
Forging billets, Chicago	70.00
Wire rods, Pittsburgh (nom.)	65.00
Bessemer billets, Youngstown	50.00 to 55.00
Bessemer billets, Pittsburgh	50.00 to 55.00
Open hearth billets, Pittsburgh.	50.00 to 55.00
Open hearth billets, Youngstown	50.00 to 55.00
Bess. sheet bars, Youngstown	50.00 to 55.00
Op. h'th sheet bars, Youngstown	50.00 to 55.00
Bess. sheet bars, Pittsburgh	50.00 to 55.00
Open hearth sheet bars, Pbgh.	50.00 to 55.00
Muck bars, Pittsburgh (nominal)	50.00

SKELP

Grooved steel skelp	2.70c to 2.80c
Sheared steel skelp	3.00c to 3.25c

RAILS AND TRACK MATERIAL

(Gross tons.)

Stand. Bess. rails, Pbgh & Chgo.	$33.00
Stan. op-h'th rails, Pbg & Chgo.	35.00
Light rails 8 to 10 lbs., Pbgh.	45.00
Light rails, 8 lb., Chicago	43.00
Light rails, 12 to 14 lbs., Pbgh.	44.00
Light rails, 12 lbs., Chicago	42.00
Light rails, 16 to 20 lbs., Pbgh.	43.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York, (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails, 16 to 20 lbs., Chgo.	$41.00
Light rails, 25 to 45 lbs., Pbgh.	42.00
Light rails, 25 to 45 lbs., Chgo.	40.00
Relaying rails, standard, Pbgh. and Chicago	$23.00 to 24.00
Relaying rails light, Chicago	24.00 to 25.00
Angle bars, st. sect., Pbgh. base	2.00c to 2.50c
Angle bars, st. sections, Chgo.	2.25c to 2.75c
Spikes, railroad, Pittsburgh	2.65c to 2.75c
Spikes, railroad, Chicago	2.75c to 2.90c
Track bolts, Pittsburgh	4.25c to 4.75c
Track bolts, Chicago	4.25c to 4.50c
Tie plates, Chicago	50.00 to 55.00

SHAPES, PLATES AND BARS

Structural shapes, con. Pbgh.	2.80c
Structural shapes, Pbgh.	2.85c
Structural shapes, Philadelphia	2.959c to 3.009c
Structural shapes, Chgo.	2.99c to 3.44c
Structural shapes, New York	2.869c to 3.019c
Tank plates, Chgo.	3.44c to 3.69c
Tank plates, Pittsburgh (con.)	3.25c to 3.50c
Tank plates, Pbgh.	3.50c to 4.00c
Tank plates, Philadelphia	3.659c to 4.159c
Tank plates, New York	3.669c to 4.169c
Bars, soft steel, Chicago	2.89c to 3.50c
Bars, soft steel, Pbgh. (con.)	2.70c to 2.80c
Bars, soft steel, Pbgh.	2.85c
Bars, soft steel, New York	2.869c to 3.019c
Bars, soft steel, Philadelphia	2.859c to 3.009c
Hoops, carloads, Pittsburgh	3.25c
Bands, Pittsburgh	2.70c
Shafting, Pbgh., contr. carloads	10 to 20 off
Bar iron, Chgo.	2.45c to 2.50c
Bar iron, Philadelphia	2.559c to 2.659c
Bar iron, Cleveland	2.55c
Bar iron, New York	2.569c to 2.669c
Bar iron, Pittsburgh	2.65c to 2.75c
Hard Bess. steel bars, Chgo.	2.50c to 2.60c

SHEETS

(In cents per pound.)
(Open hearth material takes 10c above prices of bessemer.)

SHEET MILL BLACK.

Gage.	Bessemer.
17 to 21	3.45
22 to 24	3.50
25 and 26	3.55
27	3.60
28	3.65
29	3.70
30	3.80

TIN MILL BLACK

Gage.	Bessemer.
15 and 16	3.45
17 to 21	3.50
22 to 24	3.55
25 to 27	3.60
28	3.65
29 and 30	3.70
30½ and 31	3.75

GALVANIZED.

Gage.	Bessemer.
10 and 11	4.00 to 4.50
12 to 14	4.10 to 4.60
15 and 16	4.25 to 4.75
17 to 21	4.40 to 4.90
22 to 24	4.55 to 5.05
25 and 26	4.70 to 5.20
27	4.85 to 5.35
28	5.00 to 5.70
29	5.20 to 5.70
30	5.40 to 5.90

BLUE ANNEALED.

Gage.	Bessemer.
3 to 8	3.50
9 to 10	3.25
11 to 12	3.25
13 and 14	3.35
15 and 16	3.40

No. 28, black, Chicago	3.94c
No. 28 galvanized, Chicago	5.19c
No. 10, blue annealed, Phila.	3.419c
No. 10, blue annealed, Chgo.	3.44c to 3.69c

TIN PLATE

Tin plate, 100 lb., coke base	6.00c to 6.50c
Terne plate	4.90c

IRON AND STEEL PIPE

(Prices Adopted Nov. 1, 1916.)

Steel.

Butt weld:—	Black.	Galv.
⅛, ¼ and ⅜ in.	62	35½
½ in.	66	51½
¾ to 3 in.	69	55½
Lap weld:—		
2 in.	62	49½
2½ to 6 in.	65	52½
7 to 12 in.	62	48½
13 and 14 in.	52½	....
15 in.	50	....

Iron.

Butt weld:—	Black.	Galv.
⅛ and ¼ in.	51	24
⅜ in.	52	25
½ in.	56	38
¾ to 1½ in.	59	43
Lap weld:—		
1¼ in.	45	30
1½ in.	51	37
2 in.	52	38
2½ to 6 in.	54	41
7 to 12 in.	53	40

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	52
Iron, 3½ to 4½ inches, l. c. l.	42

IRON AND STEEL PRICES

Corrected up to Tuesday noon

WIRE PRODUCTS

(Adopted Nov. 6, 1916.)
(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.85
Plain wire, jobbers', Pittsburgh	2.80
Galvanized wire, jobbers', Pbgh	3.50
Polished staples, Pbgh	3.00
Galvanized staples, Pbgh	3.70
Barb wire, painted, jobbers', Pbgh.	3.00
Barb wire, galv., jobbers', Pbgh	3.70

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 50 and 5, cut threads, 40, 10 and 2½, larger or longer, 35 and 2½.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter rolled 50, and 10; cut, 50; larger or longer, 40 and 5.

Cold pressed, semi-finished hexagon nuts, 60 and 5.

Gimlet and cone point lag bolts, 50 and 10. Hot pressed square, blank or tapped nuts, $2.70 off list; hot pressed hexagon blank or tapped, $2.70.

Cold pressed square, blank or tapped, $2.40 off; hexagon, blank or tapped, all sizes, $2.80.

RIVETS

Structural rivets, Pbgh	4.00c
Structural rivets, Chgo. delivery	4.25c
Boiler rivets, Pbgh	4.10c
Boiler rivets, Chgo. delivery	4.35c

Tinner's rivets, 45, 10 and 5 off, Pittsburgh.

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	2.70c to 2.80c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	5.00c to 5.50c

COLD ROLLED STRIP STEEL

Base price 6.50c to 7.00c per 100 pounds, hard, coils 1½ inches and wider and by .100 inch and heavier.

CAST IRON WATER PIPE

Four-inch, Chicago	$35.50 to 36.00
Six-inch and larger, Chicago	32.50 to 33.00
Six-inch Class B, New York	32.50
Four-inch Class B, New York	35.50
Four and six-inch Birmingham	30.50 to 31.00
Six-inch and larger, Birmingham	27.50 to 28.00

Light weight water and gas pipe $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	3.35c
Steel squares, 2-in. & ov., Cleve.	4.00c
Steel rounds, 2-in. & ov., Cleve.	4.00c
Steel bars, und. 2 in., Cleveland	3.50c
Steel bars, Detroit	3.25c
Steel bars, Philadelphia	3.25c
Steel bars, New York	3.35c
Steel bars, St. Louis	3.40c
Steel bars, Cincinnati	3.35c to 3.90c
Steel bars, St. Paul	3.45c
Steel bars, over 2-in., Buffalo	4.20c
Steel bars, Buffalo	3.35c
Iron bars, Chicago	3.35c
Iron bars, Cleveland	3.35c
Iron bars, Detroit	3.20c to 3.25c
Iron bars, St. Louis	3.20c to 3.25c
Iron bars, Cincinnati	3.35c to 3.90c
Iron bars, Philadelphia	3.25c
Iron bars, New York	3.35c
Shapes, Chicago	3.35c
Shapes, Detroit	3.25c
Shapes, St. Louis	3.40c
Shapes, St. Paul	3.45c
Shapes, New York	3.35c
Shapes, Cleveland	3.60c
Shapes, Philadelphia	3.25c
Shapes, Buffalo	3.35c
Shapes and plates, Cincinnati	3.35c to 3.75c
Plates, Chicago	4.00c
Plates, Detroit	3.75c to 4.00c
Plates, St. Louis	4.05c
Plates, St. Paul	4.10c
Plates, New York	4.25c to 4.50c
Plates, Cleveland	4.10c
Plates, Philadelphia	4.00c to 4.50c
No. 10 blue anl. sheets, Chicago	3.65c
No. 10 blue anl. sheets, Cleve.	3.75c
No. 10 blue anl. sheets, Buffalo	3.25c
No. 10 blue anl. sheets, St. L.	3.70c
No. 10 blue anl. sheets, Cinci.	3.50c
No. 10 blue anl. sheets, St. Paul	3.75c
No. 10 blue anl. sheets, Detroit	3.55c
No. 28 black sheets, Chicago	3.90c
No. 28 black sheets, Cleveland	3.90c
No. 28 black sheets, Cincinnati	3.75c
No. 28 black sheets, Detroit	3.40c to 3.50c
No. 28 black sheets, St. Louis	3.95c
No. 28 black sheets, St. Paul	4.00c
No. 28 galv. sheets, Chicago	5.40c
No. 28 galv. sheets, Cleveland	5.25c
No. 28 galv. sheets, Cincinnati	4.50c to 5.00c
No. 28 galv. sheets, Detroit	5.00c
No. 28 galv. sheets, St. Louis	5.30c to 5.40c
Hoops, Cleveland	4.25c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Angle bars, iron, Chicago	$24.50 to 25.00
Angle bars, steel, St. Louis	16.50 to 17.00
Arch bars and transoms, Chgo.	26.00 to 26.50
Arch bars and transoms, St. L.	24.00 to 24.50
Boiler plate, cut, No. 1, Chgo.	10.50 to 11.00
Boiler plate, cut, No. 1, St. L.	11.50 to 12.00
Boiler punchings, Chicago	14.75 to 15.50
Bundled sheet, Cincinnati	8.75 to 9.25
Busheling, No. 1, Chicago	16.25 to 16.75
Busheling, No. 1, Cincinnati	12.75 to 13.25
Busheling, No. 1, Cleveland	15.75 to 16.00
Busheling, No. 1, St. Louis	14.50 to 15.00
Busheling, No. 2, Chicago	11.00 to 11.50
Cast borings, Chicago	7.75 to 8.25
Cast borings, Cincinnati	4.75 to 5.25
Cast borings, Cleveland	7.00 to 7.25
Cast borings, St. Louis	6.25 to 6.50
Cast, No. 1, Chicago	15.50 to 16.00
Cast, No. 1, Cincinnati	12.50 to 13.00
Cast, No. 1, Cleveland	14.75 to 15.00
Cast, No. 1 St. Louis	13.50 to 14.00

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—

New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	83.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Cut forge, Chicago	19.50 to 20.00
Iron axles, St. Louis	33.50 to 34.00
Iron axles, Cleve	37.00 to 38.00
Knuckles, coup., Chicago	20.00 to 20.50
Knuckles, coup., St. Louis	18.00 to 18.50
Locomotive tires, Chicago	25.50 to 26.00
Locomotive tires, St. Louis	23.50 to 24.00
Machine shop turnings, Chgo	6.75 to 7.25
Machine shop turnings, Cleve	5.75 to 6.00
Machine shop turn'gs, Cincinnati	5.25 to 5.75
Machine shop turnings, St. L.	6.25 to 6.50
Malleable agricultural, Chgo	11.00 to 11.50
Malleable agricultural, St. Louis	12.50 to 13.00
Malleable, Cincinnati	9.00 to 9.50
Malleable railroad, Chicago	16.50 to 16.50
Malleable railroad, St. Louis	13.00 to 13.50
Pipes and flues, Cleveland	13.25 to 13.50
Pipes and flues, Chgo	14.50 to 15.00
Pipes and flues, St. Louis	13.50 to 14.00
Railroad wrought, No. 1, Chgo.	20.50 to 21.00
Railroad wrought, No. 1, Cleve.	19.50 to 20.00
Railroad wrought, No. 1, St. L.	18.50 to 19.00
Railroad wrought, No. 1, Cinci.	15.00 to 15.50
Railroad wrought, No. 2, Chgo.	19.50 to 20.00
Railroad wrought, No. 2, St. L.	17.75 to 18.00
Shafting, St. Louis	23.00 to 23.50
Springs, Chicago	20.00 to 20.50
Steel car axles, St. Louis	37.00 to 38.00
Steel car axles, Chicago	37.00 to 38.00
Stove plate, Chicago	11.25 to 11.75
Stove plate, Cleveland	12.00 to 12.50
Stove plate, Buffalo	12.00 to 12.50
Stove plate, Cincinnati	8.50 to 9.00
Stove plates, St. Louis	12.00

(Gross tons.)

Axle turnings, Cleveland	$11.50 to 11.75
Busheling, No. 1, Buffalo	14.00 to 14.50
Busheling, No. 1, Pittsburgh	14.75 to 15.25
Busheling, No. 2, Buffalo	11.50 to 12.00
Bundled sheets, Pittsburgh	13.00 to 13.25
Bundled sheets, Cleveland	11.50 to 12.00
Bundled sheets, Buffalo	11.50 to 12.00
Car wheels, (iron), Pittsburgh	15.50 to 16.00
Car wheels (steel), Pittsburgh	19.00 to 19.50
Car wheels, Chicago	15.00 to 15.50
Car wheels, eastern Pa.	16.50 to 17.00
Car wheels, Buffalo	15.50 to 16.00
Car wheels, New York	14.50 to 15.00
Car wheels, St. Louis	13.50 to 14.00
Car wheels, Birmingham	10.50 to 11.00
Tram car wheels, B'ham	9.50 to 10.00
Cast borings, New York	7.50 to 7.75
Cast borings, eastern Pa.	10.50 to 11.00
Cast borings, Buffalo	8.00 to 8.25
Cast borings, Pittsburgh	9.00 to 9.25
Cast, No. 1, eastern Pa.	16.75 to 17.25
Cast, No. 1, Pittsburgh	15.75 to 16.25
Cast, No. 1, Birmingham	11.00 to 11.50
Cast, heavy No. 1, N. J. points	16.00 to 16.50
Forge, No. 1, eastern Pa.	12.50 to 13.00
Frogs, switches, guards, St. L.	19.00 to 19.50
Grate bars, Buffalo	13.00 to 13.50
Grate bars, N. J. points	12.00 to 12.25
Heavy axle turnings, Buffalo	12.00
Heavy melting steel, Pittsburgh	19.25 to 19.50
Heavy melting steel, Buffalo	18.25 to 18.75
Heavy melting steel, Chicago	18.00 to 19.00
Heavy melting steel, Cleveland	18.50 to 19.00
Heavy melting steel, Cincinnati	16.00 to 16.50
Heavy melting steel, eastern Pa.	16.50 to 17.00
Heavy melting steel, New York	15.00 to 15.50
Heavy melting steel, St. L.	19.50 to 20.00
Heavy melting steel, B'ham	11.00 to 11.50
Iron rails, Chgo	24.00 to 24.50
Iron rails, Buffalo	20.50 to 21.00
Iron rails, Cincinnati	19.00 to 19.50
Iron rails, St. Louis	21.50 to 22.00
Iron rails, Cleveland	22.00
Iron axles, Pittsburgh	35.00 to 36.00
Iron axles, Cincinnati	24.50 to 25.00
Iron axles, eastern Pa.	30.00 to 32.00
Iron axles, Chicago	38.00 to 40.00
Iron axles, Buffalo	34.00
Low phos. steel, Buffalo	24.00 to 25.00
Low phos. steel, Pittsburgh	22.00 to 23.00
Low phos. steel, eastern Pa.	22.50 to 23.50
Machine shop turnings, Buffalo	7.00 to 7.50
Mch. shop turnings, New York	7.00 to 7.50
Mch. shop turnings, Pittsburgh	8.00 to 8.50
Mch. shop turnings, eastern Pa.	9.00 to 9.50
Mch. shop turnings, Birmingham	6.50 to 7.00
Malleable railroad, Cleveland	18.50 to 19.00
Malleable railroad, Buffalo	15.50 to 16.00
Malleable railroad, Pittsburgh	16.00 to 16.25
Malleable railroad, eastern Pa.	13.00 to 14.00
R. R. and mch. cast, No. 1 Bfl.	17.50 to 18.00
R. R. wrought, No. 1, Buffalo	20.50 to 21.00
R. R. wrgt., No. 1, eastern Pa.	23.00 to 23.50
City wrought, New York	15.00 to 15.50
R. R. wrought, No. 1, Pbgh	19.75 to 20.50
R. R. wrought, No. 1, B'ham	12.00 to 12.50
Reroll. rails, 5 ft. and ov., Pbg.	20.25 to 21.25
Reroll. rails, 5 ft. & ov., Chgo.	24.50 to 25.00
Reroll. rails, 5 ft. & ov., E. Pa.	20.50 to 21.00
Reroll. rails, 5 ft. & ov., St. L.	21.50 to 22.00
Shafting, New York	19.50 to 20.00
Shafting, eastern Pa.	22.00 to 22.50
Shoveling steel, Chicago	17.00 to 17.50
Shoveling steel, St. Louis	18.00 to 18.50
Steel rails, short, Chicago	21.00 to 21.50
Steel rails, short, Cleveland	22.50 to 23.00
Steel rails, over 6 ft. Cleveland	19.50 to 20.50
Steel rails, old, B'ham	12.00 to 12.50
Steel rails, short, St. Louis	20.50 to 21.00
Steel car axles, Birmingham	26.00 to 27.00
Steel car axles, New York	32.00 to 33.00
Steel car axles, Buffalo	34.00
Steel car axles, Cleveland	41.00 to 42.00
Steel car axles, Pittsburgh	35.00 to 36.00
Steel car axles, eastern Pa.	30.00 to 32.00
Stove plate, N. J. points	12.25 to 12.75
Stove plate, Birmingham	9.00 to 9.25
Stove plate, Pittsburgh	12.00 to 12.50
Stove plate, eastern Pa.	14.00 to 14.50
Wrought pipe, New York	13.75 to 14.00
Wrought pipe, eastern Pa.	16.00 to 16.50
Wrought pipe, Buffalo	13.50 to 14.00

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ANTIMONY OXIDES.
Wah-Chang Mining & Smelting Co., New York City.

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BANDS. (Steel.)
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Franklin Steel Works, Franklin, Pa.
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Trussed Concrete Steel Co., Detroit, Mich.
Upson Nut Co., Cleveland, O.

BARS. (Iron and Steel.)
American Bridge Co., New York, N. Y.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Company, Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
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Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
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Lackawanna Steel Co., Buffalo, N. Y.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
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Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Trussed Concrete Steel Co., Detroit, Mich.
United Alloys Steel Corp., The, Canton, O.
Upson Nut Co., Cleveland, O.
Westerman & Co., Lockport, N. Y.

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Belmont Iron Works, Philadelphia, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Empire Art Metal Co., College Pt., N. Y.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

BEARINGS. (Ball.)
New Departure Mfg. Co., Bristol, Conn.

BEARINGS. (Vanadium Steel.)
American Vanadium Co., The, Pittsburgh, Pa.

BELT CEMENT AND DRESSING.
Graton & Knight Mfg. Co., Worcester, Mass.
Texas Company, The, New York City.
Williams, I. B., & Sons, Dover, N. H.

BELT LACING. (Leather.)
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BELTING. (Chain.)
Link-Belt Company, Chicago, Ill.

BELTING—LEATHER.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.
Williams, I. B., & Sons, Dover, N. H.

BENCHES. (Steel.)
New Britain Mach. Co., New Britain, Conn.

BENCHES AND FRAMES. (Drawing.)
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., The, Cuyahoga Falls, O.

BENDING AND STRAIGHTENING MACHINES.
Abramsen Engrg. Co., Pittsburgh, Pa.
Bertsch & Co., Cambridge City, Ind.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Machine Works, Philadelphia, Pa.
Hinman, D. A., & Co., Sandwich, Ill.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

BENZOL, RECOVERY PLANTS.
Koppers, H., Co., Pittsburgh, Pa.

BILLETS.
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Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Whitaker-Glessner Co., Portsmouth Works, Portsmouth, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sheet & Tube Co., Youngstown.

BINS. (Steel.)
Empire Art Metal Co., College Pt., N. Y.

BLAST FURNACE SKIP CARS.
Lakewood Engrg. Co., Cleveland, O.

BLAST FURNACE TUYERES.
Keystone Bronze Co., Pittsburgh, Pa.

BLAST FURNACE VOLUME METERS.
Clark, Chas. J., Chicago, Ill.

BLOCKS. (Chain.)
Yale & Towne Mfg. Co., New York City.

BLOOMS.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Hillman, J. H., & Sons, Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O.

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